SCIENTIFIC AMERICAN

[Entered at the Post Office of New York, N. Y., as Second Class Matter.]

A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

Vol. XLIX.—No. 21. [NEW SERIES.] NEW YORK, NOVEMBER 24, 1883. [$3.20 per Annum. [POSTAGE PREPAID.]

THE COAL BUNKERS AT NEW TACOMA, W T.

The illustration on this page represents the great coal bunkers recently erected at New Tacoma, Washington Territory, for the storage and shipment of the product of the Wilkeson and Carbonado coal fields, that lie up against the western face of the Cascade Mountains, about 30 miles from tide water, at the head of Puget Sound. These fields are tapped by a branch of the Northern Pacific Railroad. The Carbonado is the largest yet developed, and belongs to the Central Pacific Railroad of California. This company also owns a line of large iron steam colliers which ply between New Tacoma and San Francisco, a distance of about 600 miles by water. The coal is a high grade of lignite, of good steam generating power, but not equal to the bituminous coals of the East. The great coal and iron mines, practically inexhaustible, and the vast forests of this region, make its future as a prominent industrial point certain.

The coal bunker is built at an angle to the shore, the trestle leading to it being curved. A single track is laid to a point a short distance from the shore end of the bunker, where it branches into three tracks running parallel over the top. The bunker is 300 feet long and 80 feet above high water. The bunker and the trestle leading to it are built entirely of wood, so distributed and proportioned as to give ample strength to bear the great weight to which it is subjected. The depth of water alongside the wharf is from 32 to 42 feet at low tide. The structure rests upon a foundation of 850 piles, driven to refusal. The cars are pushed down upon either track to the end, where the coal is dumped directly into bins occupying the upper portion of the bunker and having a storage capacity of 4,000 tons. From the bins the coal is guided by chutes into the hold of the collier moored alongside. The heights are so proportioned that gravity does the work of stowing and also of loading the vessel. The bunker cost about $65,000. Although of immense size, it is not sufficient to handle the output of the coal field.

In the right of the engraving is shown an elevated pier with two tracks, from which the coal is loaded directly into the vessel, no storage bins being provided.

The Mines of France.

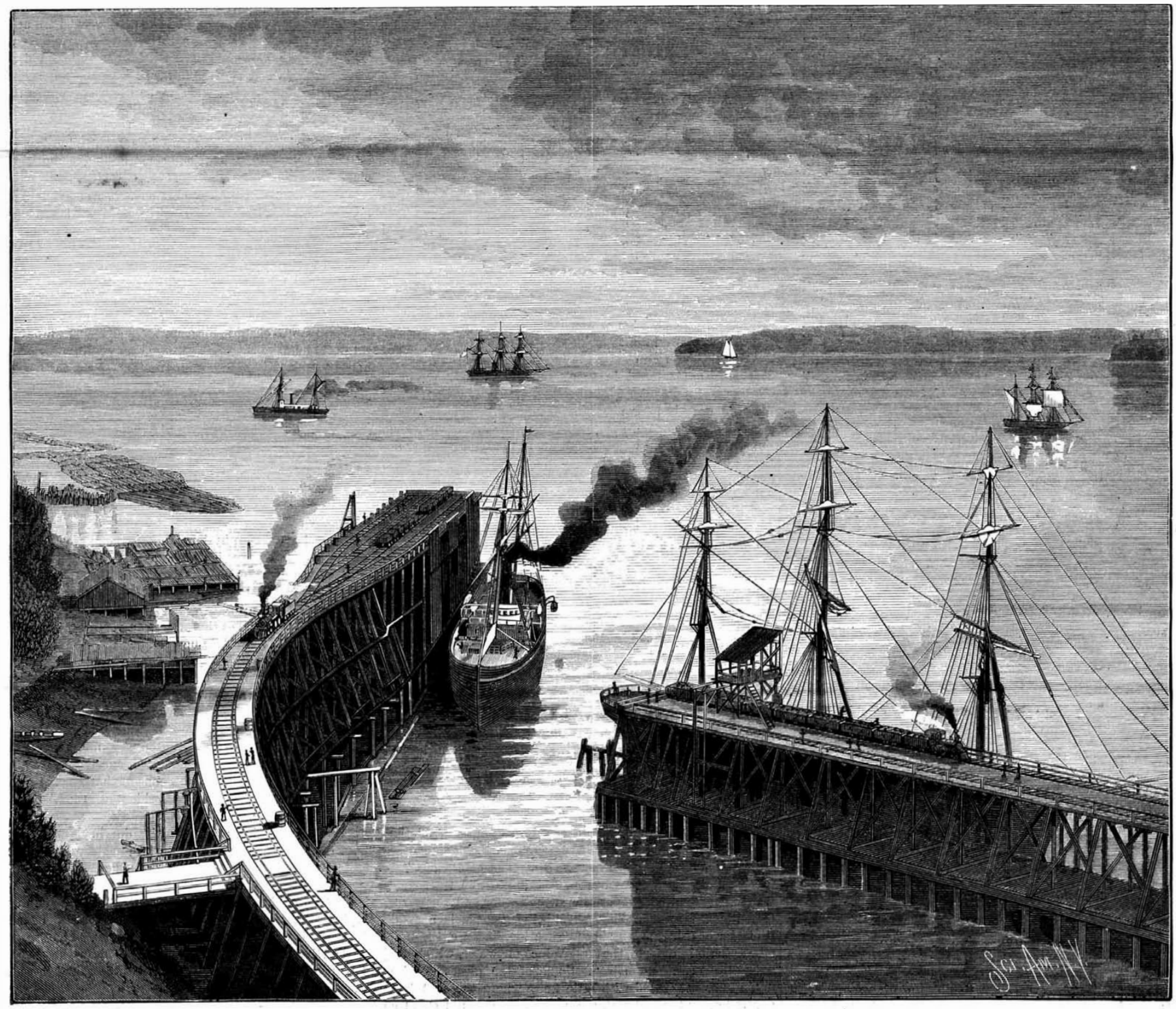
Two-thirds of the total yearly production of coal in France comes from the northern coal districts of Nord and Pas de Calais, and from the basin running southward through the Departments of the Loire, Rhone, Ardeche, and Gard to the Gulf of Lyons. The production amounted to 21,000,000 tons in 1882, which is over one-quarter that of this country, less than one-seventh that of Great Britain, and less than half the product of Germany. As early as the eleventh century the coal mines of St. Etienne were known, but were not worked to any great extent until the revolution. The northern coal fields were discovered in 1847. The consumption of coal in France last year was about 10,000,000 more tons than she produced.

France is rich in iron mines. Brown hematites are found tolerably pure and free from phosphates. The oolitic ores are the most abundant, the main mines being in the Department of Meurthe et Moselle. According to R. P. Porter in the *Tribune*, there were 4,820,000 tons of iron ore consumed in 1882, of which 40 per cent was imported from Spain, Belgium, Germany, Italy, and Algeria. The principal iron manufacturing districts are the Nord group, the Loire and Rhone group, and the Moselle group. The Loire and Rhone district is the most extensive in France, containing the finest iron and steel works in the country—that of Creusot. Forty years ago Creusot was almost unknown, but now it is a live place, containing 30,000 people, all employed in one establishment. The works are the largest in the world carried on by one proprietor, with the exception of those of Herr Krupp. In 1882 France produced 2,033,000 tons of pig iron, 1,074,054 tons of wrought iron, and 454,053 tons of steel.

Copper, lead, tin, and zinc are found in France, but in small quantities, while it is rich in salt. It is estimated that there are 25,000 quarries employing about 100,000 men.

We Beat the World on Doctors.

The proportion of doctors to the population in different countries is given as follows by the *Siglo Medico:* France, 2·91 per 10,000; Germany, 3·21 per 10,000; Austria, 3·41 per 10,000; England, 6 per 10,000; Hungary, 6·10 per 10,000; Italy, 6·10 per 10,000; Switzerland, 7 06 per 10,000; United States, 16·24 per 10,000.



THE COAL BUNKERS AT NEW TACOMA W. T. ON THE NORTHERN PACIFIC RAILROAD.

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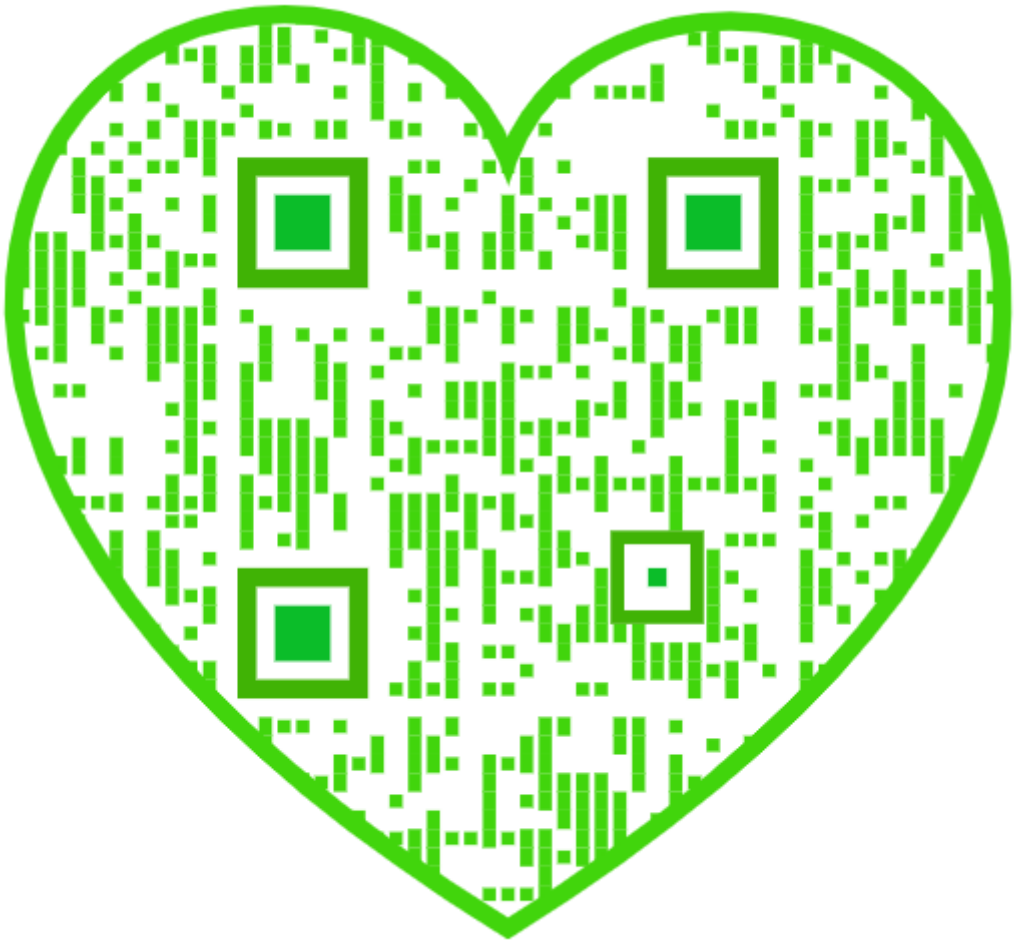

Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT

No. 261 BROADWAY, NEW YORK.

O. D. MUNN. A. E. BEACH.

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NEW YORK, SATURDAY, NOVEMBER 24, 1883.

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TRIAL OF THE HASKELL MULTICHARGE GUN.

This gun—described and illustrated in the SCIENTIFIC AMERICAN SUPPLEMENT of August 11, 1883—is now being tested by a board of army and navy officers at Sandy Hook. It is a breech-loader, weighs 25 tons, is 25 feet long, and has a bore 6 inches in diameter. Arranged longitudinally along the bottom are four pockets, which connect with the bore by passages 4 inches in diameter, placed at an angle of 55 degrees. Each pocket is 22 inches deep, and at its greatest diameter measures 11¾ inches. All the interior of the gun—bore and pockets—is made of steel.

The principle upon which the gun works is, briefly, as follows: The shot, which may be two, three, or even four diameters in length, is banded with copper to take the rifling, there being fifteen grooves having one twist in 12 feet and a depth of six one-hundredths of an inch; and after it has been placed in the gun, disks of sole leather and copper, greased, are inserted behind it in order that the close fit thus insured may prevent the gas resulting from the first explosion from getting in front of the shot. The first charge, in the breech, is of slow-burning powder, and is designed merely to start the projectile on its journey. As the shot passes the first pocket passage, the heated gases rush in and ignite the powder, which is of a quicker burning kind. The speed is proportionately increased. The same thing occurs with the second, third, and fourth pockets, the powder increasing in its burning qualities with each successive discharge. The shot issues with a velocity resulting from the combined efforts of all the powder; and although a greater quantity has been burned than would be either possible or expedient in the ordinary method of loading, the gun has been subjected to no strain likely to prove hurtful.

The aim of the gun is to deliver the shot from the muzzle with the same, or nearly the same, pressure behind it that it had at the start, and the following readings of pressures will show how nearly this was accomplished: breech, 20,200 pounds per square inch; first pocket, 19,000; second pocket, 20,200; third pocket, 19,000; fourth, 20,500. It is believed that further experiments will give even more uniform results. Various grades of powder are now being tested in order to find that most suitable to the conditions. The following table gives the weight of shot and of the several charges of powder, the pressures, and the velocities at 100 feet from the muzzle:

No. of round.	Weight of shot.	Charges of powder in pounds.					Pressure in pounds per square inch.					Velocity in feet per second at 100 feet.
		Breech.	1st pocket.	2d pocket.	3d pocket.	4th pocket.	Breech.	1st pocket	2d pocket.	3d pocket.	4th pocket.	
24	110	15	20	22	22	22	21,800	20,200	24,000	21,600	25,100	1.814
25	110	15	20	22	22	22	21,300	20,600	22,800	21,800	25,000	1,802
26	151	13	17	17	17	17	19,000	19,800	19,000	19,800	18,000	1,449
27	155	14	18	18	18	18	21,600	19,600	20,100	20,400	19,600	1,486
28	110	16	22	20	20	20	23,200	24,000	19,600	22,000	21,400	1,864
29	155	14	20	20	20	20	19,600	19,600	20,400	21,000	20,700	1,558
30	110	17	23	23	23	23	23,600	26,600	21,400	25,500	29,000	1,924

In rounds No. 26, 27, and 29 the shots were four diameters, and the resulting pressures and velocities are remarkable. Considering the weights of powder and shot, the pressures and velocities are in advance of any yet obtained from a single charge 6-inch gun.

It will be of interest in this connection to note some of the best results obtained by English practice after long study regarding the size, form, hardness, and density of the powder, the dimensions of the powder chamber in the gun, and the space occupied by the charge, and the careful noting of the pressures exerted in different parts of the seat of the charge. According to Sir Frederick Abel, in his presidential address before the Society of Chemical Industry, the following results are given, which, although not exceptional now, are much in advance of the best obtained two years ago:

"From a 9-inch gun a 200 pound shot is propelled by the discharge of 320 pounds of powder with a velocity of over 2,000 feet per second, with the development of only 16 tons pressure on the square inch; from a 10·4 inch gun a 462 pound shot is propelled by 310 pounds of powder with the same velocity and with the development of the same pressure; from a 12-inch gun a 714 pound shot is propelled by 400 pounds of powder with a velocity of nearly 2,200 feet per second, and a development of 18·8 tons pressure."

These results are better than those of former years in regard to diminution of pressure, its uniformity in different parts of the bore, and high velocity. Large cylindrical or prismatic powder of normal composition is used.

REPAIRING SUSPENSION BRIDGE CABLES.

The suspension bridge at Pittsburgh, Pa., was built some twenty-four years ago, and a recent examination of the cables near their moorings showed them to be much corroded, and consequently reduced in strength. The cables are 7¼ inches in diameter, and when placed in position their ends were covered with a preparation of boiled tar and then protected by concrete masonry. The belief that tar is a good protector of iron has long been cast aside, because, through atmospheric influences, the tar develops tar water, which has a disastrous effect upon iron. Some of the pieces of wire taken out were dotted with little holes where the rust had gnawed away the material, and wires which should stand a strain of 1,200 pounds gave way at 200.

When this state of affairs was ascertained, Mr. F. Collingwood, of the Brooklyn Bridge, was intrusted with the work of repair. Each cable was carefully overhauled and the tar scraped off. When a defective piece was found, it was cut out and a new piece spliced in. The splicing was a difficult and delicate job, for although it was easy to join the ends it required care and judgment to subject the new piece to the right strain, so that it would bear its portion of the load. Slack wires would only add to the weight without helping to carry it. Each splice was put in with a grip machine, and the amount of strain was kept uniform by nice tests. In one large cable 175 wires had to be spliced, in another 31, in another 75, in another 5, and in another 31, while there are yet three to be examined. In the larger cables there are 600 wires and in the smaller 200.

The work is very tedious, as only a few men can work at a time. After the repairs have been made the wires are covered with linseed oil, which is allowed to dry, when a thorough application of white lead is put on. The wires are then drawn together by bands of small wire 7 inches apart. The bundle thus formed is wrapped with wire one-sixteenth of an inch thick, and it requires about 300 feet of this wire to wrap one foot of cable. The work is then finished by coating with ordinary white lead.

When building the bridge the moorings were so cased in masonry that they could not be examined. This added to the cost and labor of making the repairs. In case it should be necessary to repaint or repair the cables in the future, the masonry has been replaced by a water tight brick tunnel provided with iron water shedders, and covered with iron plates that can be lifted when admittance is desired.

Technical Education in the Carriage Trade.

At the recent convention of the Carriage Builders' National Association, by far the largest meeting ever held of members of this trade, the related subjects of apprentices and technical schools for boys received a large share of attention. The absence of any regular apprentice system in the trade was deprecated, but the idea of establishing and enlarging the field of possible usefulness of technical schools was generally approved. There has been for some time such a school in New York, under the auspices of the Association, of the results of which a satisfactory report was made. "Certificates of progress" and some minor prizes are here given, and also one "grand prize" is to be awarded at the present term, consisting of a three months' residence in Paris, and tuition during that period in the celebrated Dupont School of Carriage Draughting; all expenses of such residence, tuition, and traveling to be defrayed from a fund specially raised for that purpose at the Cincinnati Convention in 1881. The general studies at this school have been: 1. Linear designing, including scale and full size drawing. 2. Geometry applied to carriage construction, including the principles of the "French Rule." 3. Carriage body making. 4. Construction of carriage gearings. 5. Wheel making. 6. Principles involved in the suspension of carriages.

In order, however, to enlarge the sphere of usefulness of this technical school, the committee in charge have decided to adopt what has been known as the "Chautauqua" system, whereby classes may be organized in various parts of the country, and their instruction carried on by correspondence, according to a regular system. Lesson papers, with directions and schemes for elementary drawing, are to be sent out, and after these are returned they will be corrected and sent back, with further instructions from the teacher. Therefore, says the chairman of the committee, "we are now ready to teach any apprentice or artisan in the land all the mysteries of mechanical drawing"—as related to the carriage trade, of course. This proposed action was heartily approved by the members of the convention, and liberal subscriptions were made on the spot to enable it to be thoroughly carried out.

James Marion Sims.

This distinguished physician and surgeon died very suddenly of heart disease at his home in this city on November 13. He was born in Lancaster district, South Carolina, January 25, 1813. He graduated from the South Carolina College at Columbia in 1832, and then studied medicine at Charleston, S. C., and at the Jefferson Medical College in Philadelphia, from which he graduated in 1835. He immediately began practice in Montgomery County, Ala. He soon obtained eminence as a surgeon. He came to New York in 1853. Two years later, through his efforts, a Woman's Hospital Association was formed. Still later he brought about the establishment of the Woman's Hospital at Forty-ninth Street and Lexington Avenue. In 1861 he visited Europe, and in Paris operated successfully in the hospitals before the eminent surgeons of that city. He received many honors. He was President of the American Medical Association.

In a private hospital established by him in Montgomery, Ala., he began a course of experiments in regard to vesico-vaginal fistula, then regarded as incurable, which resulted successfully. He had introduced the use of sutures of silver wire instead of the silken and other sutures formerly in use, and he afterward extended the employment of metallic sutures to all departments of general surgery. He also perfected all the mechanical appliances required for the successful treatment of the above-mentioned disease, and invented the famous "Sims speculum."

AN atmosphere containing 14 per cent of carbolic acid has been found to be a guard against explosions of fire damp.

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THE AMERICAN INSTITUTE FAIR.

The present exhibition at the American Institute, this city, is one of the best held for years; the exhibits of merit are comparatively numerous.

The Straight Line Engine Company, of Syracuse, N. Y., show an engine designed by Prof. John E. Sweet, in accordance with the axiom that a straight line is the shortest distance between two points. There is no packing except the piston rings, the valve and piston rods being of ground steel working through long Babbitt bushings, and the cylinder head and steam chest cover have ground joints. The connecting rod, eccentric rod, and rocker are of cast steel; crosshead pin and valve motion pins are steel, ground and case hardened. Crank and shaft, steel ground and polished. A single balanced slide valve is used, actuated by a single eccentric that is varied in its throw by the governor which controls the cut-off, and which is placed in the fly wheel. There are fewer pieces in the engine than common, and the working joints are reduced in number. The material is admirably distributed to receive the strains coming upon it. But little foundation is required, and the engine runs quietly at a high speed. It is stated that under no conditions will the speed vary more than two per cent.

The vise manufactured by Read, Gleason & Read, of Brooklyn, N. Y., contains a steel rack whose rear end is bent at right angles and which is attached to the stationary jaw by bolts. A steel nut having teeth on its lower side engages with the rack, and has its rear end inclined upward. A box is secured in the sliding bar, on the forward end of which are reversed inclines corresponding with the nut and between which the reduced end of the screw rests. The box also carries a concave piece fitting over the screw and pressed forward by a spring. By turning the screw to the left the nut is carried back, forcing the concave piece from over the end of the screw, and bringing the inclines together, thus raising the nut from the rack and allowing the front jaw of the vise to slide. A pin placed in the lower front end of the box slips under the end of the nut, when the nut is raised from the rack and holds it up until the inclines are separated, to allow it to drop square in the rack. When the screw is turned to the right, the nut is drawn back from contact with the pin. The vise is strong, the jaws can be quickly adjusted to any width, and the work is securely held. Vises which swivel horizontally and also universally are shown.

Located at conspicuous points throughout the building are clocks from the Pneumatic Clock Company, of 14 Murray Street, this city. They are all regulated by a central clock to which a simple air pump, consisting of a lever to each end of which a cylinder is suspended, open end down. Under each cylinder is a jar partly filled with glycerine. A small pipe runs through the center of the jars, one end reaching above the surface of the liquid and the other conducted to the different clocks. By the alternate motion of the lever the cups are, at every other minute, plunged into the glycerine, thereby compressing the air in the cups and tubes, causing the small cylinder of similar air pumps on each clock to rise and start the hands forward one minute. As the cylinder on the main clock is lifted every minute, the air is released and any expansion or contraction neutralized.

A one-ton wheel made by John G. Avery, of Spencer, Mass., has for a belt a thread of cotton passing over one of the lines of shafting. The journal which permits of this consists of a hardened tube fitting over the shaft and into a shell containing small hardened rolls. An internally hardened box goes over the shell. With modifications to suit conditions these may be applied to shafting, carriage and car axles, etc.

In the pump manufactured by the Hall Duplex Steam Pump Company, of 91 Liberty Street, this city, the valves of the steam chest admit steam to the opposite cylinder through cored passages. The valve of one engine is moved by direct connection with the piston rod of the other. Each valve is composed of two simple pistons, cast together, between which the steam is admitted, thereby forming a balanced piston valve. The ports are so arranged in relation to the valves that each engine makes nearly its full stroke before opening the ports to start the other. When one has completed its stroke it rests until the other has nearly finished, the pause allowing the water valves to quietly reach their seats, and obviating the shock and jar resulting from sudden checking. The steam pistons are cushioned upon the steam caught by their passing beyond the ports. The pump plunger has a central adjustable packing moving the length of the stroke, and performs its duty by projecting into and displacing the contents of the pockets at each end of the cylinder.

The Clerk Gas Engine Company, of 1012–1018 Filbert Street, Philadelphia, have on exhibition an eight horse power engine. The motor cylinder has a diameter of 6 inches and the stroke is 10 inches. Diameter of driving pulley 18 inches, with face 8 inches; speed 180 revolutions. The engine is 4¾ feet in height, weighs 2,700 pounds, and occupies a floor space 8 feet by 3 feet 5 inches. We expect in an early issue to describe the construction of this engine and the work it accomplishes.

A train of seven bevel and miter gears is shown from Brehmer Bros., of Twelfth and Noble Streets, Philadelphia. The gears are of different sizes and number, and the shafts are parallel and at angles with each other. The fit is remarkably nice, the back lash being reduced to a minimum, and only being perceptible in one instance, which is probably due to the setting up.

"Twenty-four O'Clock."

The endeavor to make a uniform time standard throughout the country gives especial interest just now to another proposed change, which has frequently heretofore been suggested. It is that of numbering all the hours of a day up to twenty-four consecutively, instead of using the "A.M." and "P. M.," as has always been the custom. One of the Western railroads, the Cleveland, Akron, and Columbus, has recently adopted this system, and issued time cards on the twenty-four hour plan, counting the day to begin and end at midnight, which it is said have been used with great satisfaction by the employes and the public. To change watches and clocks to accommodate the new system it is proposed to put the additional numerals in a circle on the dial just inside of those now on the face, reading the outside figures for the time up to 12 o'clock, noon, and those on the inside thereafter, up to "24 o'clock," midnight.

The sending out of "standard time" from the National Observatory at Washington to principal places in the country has now become a regular practice, and the authorities are ready and willing to telegraph the time regularly to any point in the United States to those who are prepared to receive it. The following is a description of time signals, 75th meridian, mean time, to be sent out by the United States Naval Observatory on and after November 18:

The signals to be sent out by the Observatory are wholly automatic, and consist of a series of short "makes," produced in an open telegraphic circuit by the beats of a mean time clock, the pendulum closing the circuit at each beat. The signals begin at 11 h. 56 m. 45 sec., and cease at 12 h. 00 m. 00 sec., 75th meridian, mean time. During that interval there is a "make" at the beginning of every second, except that in each minute the "makes" corresponding to the 29th second, and to the 55th, 56th, 57th, 58th, and 59th seconds, are omitted. Thus the first "make" after the pause of five seconds always marks the beginning of a minute, and the first make after the pause of one second marks 30 seconds. In order to distinguish the last minute and give time to manipulate switches to time balls, controlling clocks, etc., the makes cease after 11 h. 59 m. 50 sec., and until 12 h. 00 m. 00 sec., when there is a single make, and the signals cease. When these signals are received at points where the time of the 90th meridian is used, they will give the time from 10 h. 56 m. 45 sec. to 11 h. 00 m. 00 sec., or just one hour earlier than when representing 75th meridian time; otherwise the signals will be read in the manner above described. Seventy-fifth meridian time is 8 m. 12·09 seconds earlier than Washington time.

Low Prices for Iron and Steel.

It has been evident for some time past that our smelting works and rolling mills, working at about their full capacity as they have been, were competing so closely for the trade offering as to leave very small margins for any possible profit in the business. The situation was made yet more serious, as affecting many producers, by the reduction, early in the month, of the price of steel rails from $37 to $35 per ton for rails for winter delivery. Mill proprietors have, ever since the "boom" in prices in 1879, when rails sold at $85 per ton, been studying how to reduce the cost of production, and economizing in every direction, but it was thought that when the price had declined to $40 a ton, this was as low as the manufacturers could afford to run their mills for. That this is so with many of them is proved by the fact that at once we had announcements of the stoppage of rolling mills, and furnaces blowing out in different sections, although only very limited contracts were made for rails at $35 a ton. The proprietors had in most cases been running on steel rails at $37 a ton in the hope of an improving market, but this drop in prices, with the tendency in the iron market generally to lower figures, will undoubtedly cause the closing of many establishments during a part or the whole of the winter. In bar iron, pipe, nails, etc., although there is said to be no overstock on the market, buyers are only purchasing in small quantities, according to their immediate needs, apparently satisfied that in these, as in some other staple manufactures, prices are more likely to decline, or remain where they are, than to advance.

Natural Gas for Manufacturing in Western Pennsylvania.

For nearly ten years past natural gas has been utilized for manufacturing and lighting purposes in only a few instances, although several abundantly-yielding wells, and a large territory from which it was known gas could be drawn, have been familiar topics among the manufacturers of Western Pennsylvania. Recently, however, attempts are being made to utilize this natural gas on a large scale by the iron and steel and glass manufacturers. All the window glass manufacturers of the Southside, Pittsburgh, Pa., have closed a contract with the Niagara Gas Company to supply their factories with natural gas. The company is now operating in Washington County, and representatives of each factory have been negotiating there for the drilling of gas wells and laying of pipe. The manufacturers have leased about twenty thousand acres of land in that county, in the neighborhood of the McGugin well, the largest natural gas well in the world. They expect to arrange for the drilling of several wells on their territory, the work to begin at once. The Edgar Thomson Bessemer steel works, at Braddock, Pa., have also been completing arrangements to run their whole plant, in which 100 boilers are in use, by natural gas to be obtained from a gas well at Murraysville.

Getting Foreign Help to Make U. S. Cannon.

It seems strange that, while the principal European nations have been making such vast strides in the manufacture of, and in furnishing their armies, forts, and war ships with far heavier guns than ever before made, these, too, being mostly of steel, our own government has done little or nothing in this direction since 1865. At that time we were far in advance of the rest of the world in this respect, and it was our little Monitor which gave the impulse to this great rivalry among the powers of Europe, in the making of heavy armor as well as big guns. These facts have been referred to many times, but they are again brought vividly before the public mind by the recent return of the Government joint ordnance foundry board from a visit of inspection to Europe, to get more full particulars of what our neighbors abroad were doing.

Under an appropriation of Congress at the last session, contracts were made for various alterations in some of our heavy guns, but steel of suitable masses and the requisite quality for making the new guns desired was not obtainable among our own manufacturers, nor had any of them the necessary machinery for the work. The large guns to be manufactured are after the plan now principally favored in France, a breech-loader with cast-iron body, steel tubes and steel bands, and for these, of 8 and 10 inch caliber, the tubes and jacket have been ordered in England, of Sir Joseph Whitworth. The steel hoops, being of comparatively small mass, will be manufactured in this country. Our present 10-inch Rodman smooth bores, of which many are being converted into 8-inch muzzle-loading rifles, have thus proved very efficient, and it is recommended that the work of alteration be continued; but of the bulk of our ordnance, it is stated there is hardly a piece worth keeping, one member of the board stating that "we have nothing at all in this country to compare with the guns abroad."

The board that has just returned from Europe were not allowed to visit the Krupp foundry, although such permission would have been given had they agreed to purchase cannon of him. They saw the Krupp method, however, at Aboukoff, near St. Petersburg, where the fluid steel process is used, as at the works of Sir Joseph Whitworth at Manchester, England, but not the forging by hydraulic process. Their investigations elsewhere included visits to the government and principal private works in both England and France. The ordnance departments abroad all seem to be in an unsettled condition; they are all united that steel guns must constitute the principal ordnance of the future, but the work of changing and making all over new is great, and there is no unanimity of opinion as to what is really the best of the many kinds and patterns of guns being constantly brought out.

Interesting Experiments with Hot Gases.

In November last, Dr. Werner Siemens presented to the Berlin Academy of Sciences, a paper from which it appears that gases heated to a temperature at which steel begins to melt do not emit any luminous rays, if proper care has been taken to subject them only to heating and not to chemical action. Dr. W. Hittorf, of Muenster, has since then recalled the fact that he made observations of this kind in 1879. When causing the electric spark, produced by the 1,600 cells of his battery, to pass between two platinum electrodes, he noticed the positive terminal surrounded by a yellow red light and the negative by a blue glow, but the rarefied gas between the terminals was quite dark, although hot enough to melt any metal rod held in it.

Dr. Siemens' investigations induced Dr. Hittorf to repeat his experiments, employing two iridium bars (of equilateral section with a side of 3 millimeters and 6 centimeters long) from the well known platinum works of Mr. Matthew. These iridium electrodes Dr. Hittorf fixed in strong brass rods and placed them opposite one another in a glass tube of 6 centimeters length. By arranging his powerful battery of 2,000 cells in groups so as to decrease the interior resistance, Dr. Hittorf obtained most beautiful and curious effects, the anode melting, and the cathode maintaining its sharp edges, both however at white heat, while the gases—nitrogen, hydrogen, and carbonic acid were experimented with—remained perfectly dark. From these experiments it would follow that wherever a gas is perceived to be glowing we have to deal with a combustion or other chemical combination, and not with heat effects only; and it has been established by Mr. G. Wiedemann, that the splendid luminous phenomena of the Geissler tubes are of the nature of a phosphorescence, that is to say, of a slow combustion. That only flames and not heated gases are luminous, may strikingly be proved by a very simple experiment. If a cylinder of very fine platinum foil is suspended in the hottest part of the flame of a Bunsen burner in a horizontal panel, and looked at from a distance through a narrow tube, the platinum cylinder will of course at once begin to glow, but the air within appears dark.

The earliest observation of this kind was probably made by Wedgwood, who as early as 1792 pointed out in the Philosophical Transactions that a current of air blown through a strongly heated clay tube bent in zigzag shape did not emit any light. But the fact appears to have become quite forgotten, although Melloni, the foremost investigator of his time in the field of radiation, clearly distinguished in this sense between heated gases and flames.

THERE are fifty-one complete rolling mills, and two in process of construction, at Pittsburgh.

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Magnetic Iron Sand in New Zealand.

From the report of the United States Consul at Auckland, New Zealand, it appears that the government of that colony offers a bonus of £1,000 ($5,000) to whoever will first produce, from native ore, in the colony, 200 tons of iron in blooms. In answer to this demand a furnace was established on February 8, at Auckland, the furnace being on the plan of the invention of Joel Wilson, of New Jersey. The managers claim that they can manufacture iron in Auckland much cheaper than it can be brought from England. The consul says that the United States government has granted as many as thirty-eight patents for electric separators of iron ore, and that one of these was successfully operated in the separation of iron sand obtained at Block Island, off the Connecticut coast, by the patentee, D. C. McCotter Arthur, who cleaned one hundred and twenty tons per day by means of his magnetic separator.

Similar means for procuring the pure iron free from sand have been tested in New Zealand, so far that a furnace on the American plan has been established at Onehunga, a few miles from Auckland.

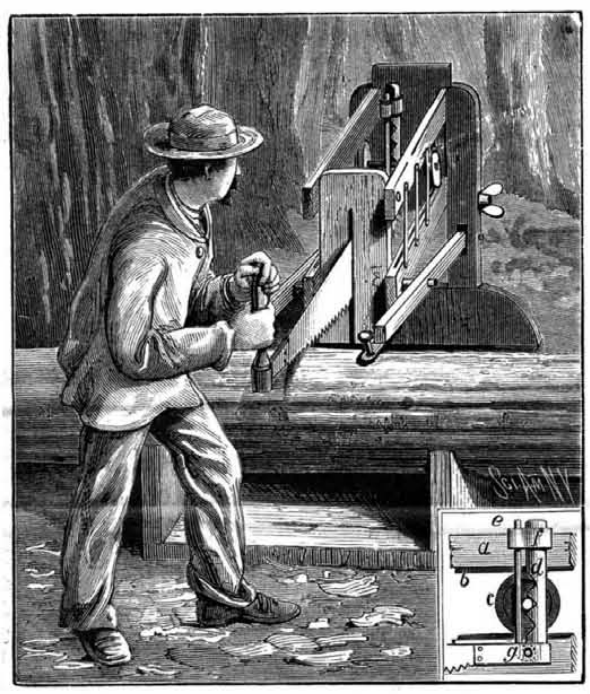
This iron sand is so pure that a portion sent to England was worked into steel for cutlery without the intermediary of puddling, being melted, cast, and at once forged under the hammer. The supply is absolutely unlimited, and cannot be estimated even by millions of tons. The ordinary yield of the sand is from fifty to seventy per cent of the mass. The magnitude of the deposits may be inferred, if not comprehended, by the statement that in the neighborhood of Waniku, in the province of Auckland, the area of this magnetic iron sand is so great that it extends from the shore miles in width and in length, submerging rocks, trees, shrubs, and covering even the tops of the distant hills.

The existence of this iron sand was well known to the earlier voyagers and later to whalemen and venturesome traders. On approaching the shore the masters of vessels that first visited these islands noticed a variation in the magnetic needle of their compasses, and attributed it to deposits of loadstone along the beach.

This deposit, the consul thinks, was formed by the action of the sea, of running streams, leaping torrents, and profuse rainfalls on cliffs, banks, and soil that hold in loose embrace the heavy particles of iron originating in volcanic rocks. The sand is of a bright blue, its attrition of particles preventing the settlement into the red oxide which would cement its grains, and it is in so fine particles as to be easily driven by the wind, forming on levels or easy slopes wavy, undulating ridges that simulate the waves of the sea.

CROSS CUT SAW FRAME.

The log is arranged on supports at one end of the base, and at the other end of the base is an upright frame fitted with guide grooves, in which the head of the saw frame can be shifted up and down when it becomes necessary to raise or lower the saw guides for altering the height of the saw, and can be secured in any position by a bolt and nut. Attached to the rear uprights are braces, extending upward and forward, to be employed for staying the logs by dogs. The bars for the support of the rails are pivoted to the braces at a point a little short of where the log rests. These bars, shown at *a*, in the small figure, are connected by stays, and between their forward ends is a vertical bar provided



SCHOOLEY'S CROSS CUT SAW FRAME.

with a slot in which a saw is free to rise and fall. The saw is connected at the end which runs in the guides to the axle of the wheels, *c*, by the notched handle, *d*, and the rod, *e*, which is pivoted at *g*, and secured to the upper end of the handle by a ring, *f*, so that by slipping the ring off the upper end of the handle the rod may be swung back to allow the saw to be set up or down as required. The handle extends up between the upper bars of the guides for holding the saw in a vertical plane. The wheels run between rails, *b*, on the guides.

This invention has been patented by Mr. Andrew Schooley, of Litchfield, N. Y

HOLLOW AUGER.

In the work of forming tenons on the ends of wheel spokes, and in similar work, the article is first pointed down with a knife or fore auger, as the hollow augers will not take hold upon the blunt end of the spoke. This is obviated by the hollow auger recently patented by Mr. James A. Rodman, of Lebanon, Texas. The head or yoke is made in one piece of a ∩-form, and is provided with a shank for being clamped in place. At the lower end of the head are the jaws, *a b*, Fig. 1, forming the hollow auger, *a* being what is termed the "off jaw," and *b* the jaw carrying the cutter. The two jaws are attached at one end by a pivot pin, so that they may be moved according to the size of tenon that is to be cut. Thin outer or moving ends are at-

RODMAN'S HOLLOW AUGER.

tached to the opposite leg of the head by a clamping screw which passes through a slot in the leg, so that the jaws may be held firmly, and a graduated scale is provided for adjusting. An arm having forked ends is pivoted to each side of the head, and at the lower ends are formed the flaring jaws of the fore auger, one of which is fitted with a cutter. These jaws come beneath the jaws of the hollow auger when the arms are brought together, and in this position they are held by the latches, *e e*, the ends of which catch into the jaws, *a b*. A spring, serving to spread the forked arms when they are released, is indicated by the saw-tooth line at the top of Fig. 1. In one of the arms of the head is a slot in which moves the stop, *f*, regulating the depth to which the spoke enters the tool and consequently the length of the tenon. In using the tool the jaws, *a b*, are set to the diameter of the tenon to be cut, the stop, *f*, is adjusted, the arms are brought together, and the latches caught. The tool being applied to the spoke, the fore auger bevels the end. When the beveled end reaches the triggers, they are raised, when the arms spring out, leaving the hollow auger free to act.

Roof Water as a Motive Power.

It has occurred to a gentleman resident in Georgetown, West Indies, that a possibly valuable source of energy is allowed to run to waste in the tropics in the shape of the water which pours off the roofs of the houses whenever there is a shower. The gentleman in question, in a lecture delivered recently before a local society, said that, "having been frequently struck by the great volume of water discharged from roofs during heavy tropical rains, it occurred to me that the power so wasted might be utilized in some way by converting it into electricity by the following means: The water from each roof might be conducted into one main downpipe, in which would work a small turbine wheel driving a dynamo electric machine, the electricity so developed by every passing shower to be stored in accumulators of the type of Faure's secondary batteries. These, as they became charged in variable time, depending on the rainfall, could be collected and stored at central depots, from whence the power could afterward be distributed uniformly, either by electro dynamic engines, or utilized directly for electric lighting!"

The Value of a Compost Heap.

The gardener and farmer are not apt to sufficiently appreciate the importance of gathering into heaps vegetable substances of all kinds to convert into manure. *Land and Water*, calling the attention of its readers to the subject, suggests the following plan for a compost receptacle:

In some convenient place lay down a sound floor of concrete, and have a roof to cover it, but open at the sides. Upon the floor collect weeds and every other kind of waste vegetable matter, road scrapings, border edgings, in fact the greater the variety and the more of it the better. Keep it moist (not over wet), and turn it over occasionally—at the same time a little salt may be sprinkled over it with great advantage. When sufficiently decomposed this will form a most valuable manure, highly rich in nitrogen in such a form as to be readily taken up by the crops. Use the liquid of cattle and the domestic liquid waste from the house, and it will surprise many what a store of good manure will soon accumulate.

The Creosoting of Timber.

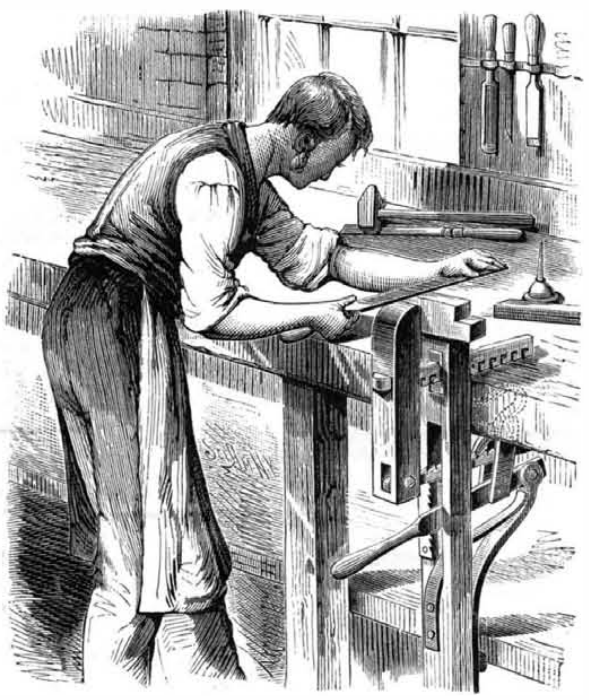
As is well known, the preservative properties of creosote are owing to its preventing the absorption of the atmosphere in any form, or under any change of temperature. It is noxious to animal or vegetable life; and it arrests all fermentation of the sap, which is one of the primary causes of dry rot and other species of decay in timber. The action of creosote—says Mr. Bale, in his work on "Saw Mills: Their Arrangement and Management"—may be thus described: When injected into a piece of wood, the creosote coagulates the albumen, thus preventing any putrefactive decomposition; and the bituminous oils enter the whole of the capillary tubes, incasing the woody fiber as with a shield and closing up the whole of the pores, so as to entirely exclude both moisture (water) and air. By using creosote, inferior porous timber and that cut at the wrong season, and therefore sappy, may be rendered durable. The Bethell system of creosoting is as follows: The timber is first thoroughly seasoned and cut to the required dimensions. It is then placed in a wrought iron cylinder, fitted with doors that can be hermetically closed by means of wrought iron clamps. The air and moisture contained in the wood are then exhausted from it, and from the cylinder, by means of a powerful air pump. The pores of the wood being now empty, the preservative material (creosote oil) is admitted into the tank. When the wood has received all that it will after this manner, more oil is forced into it by means of hydrostatic pumps, exerting a pressure of 120 pounds to 200 pounds per square inch. This pressure is maintained until it appears that the proper quantity of creosote oil has been absorbed by the wood, which is determined by a gauge. Timber intended for railway sleepers, bridges, etc., should absorb 7 pounds of oil per cubic foot; and timber required to be protected against marine insects, etc., requires at least 10 pounds of oil per cubic foot. The cost varies from 4d. to 5d. per cubic foot, according to the quantity of oil required.

Cable Telegraphy.

According to recent trials of the speed of working on the Jay Gould cables laid across the Atlantic from Penzance to Canso, in Nova Scotia, 1,000 code words were sent from Penzance and received at the Canso station in 81 minutes, including all repetitions and corrections. The 1,000 words consisted of 7,288 letters, which is about equivalent to 1,458 words of 5 letters each, the average number for the English language. The above rate of transmission is therefore equal to 18 words of 5 letters per minute.

IMPROVED VISE.

The vise herewith illustrated is constructed with two vertical jaws, each provided near the upper end with a slot. A bar having hook teeth on its bottom edge is pivoted in the slot of the outer jaw, passing through the other slot, the teeth of the bar projecting toward the front. On the rear surface of the inner jaw is a slotted plate, on the bottom cross piece of which the hooked teeth of the bar catch. A bar which has its upper edge toothed and its lower edge beveled is pivoted to the lower end of the outer jaw and passes through a slot in the other jaw. The beveled edge rests upon a grooved roller in the slot. An arm is secured



ANDERSON'S IMPROVED VISE.

to the inner jaw, and to its upper end is pivoted a lever, which passes through a slot, on one side of which is a ratchet plate. Attached to the lever just in front of the pivot is an arm, to whose upper end is fastened a spring, and also a pawl engaging with the teeth on the upper edge of the lower bar. When the handle of the lever is moved downward, the pawl moves the lower bar and consequently the lower part of the front jaw forward, closing the jaws upon the work. The ratchet plate holds the lever at any elevation

This invention has been patented by Mr. William T. Anderson, of Rock Hill, S. C.

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A Vacuum a Good Conductor.

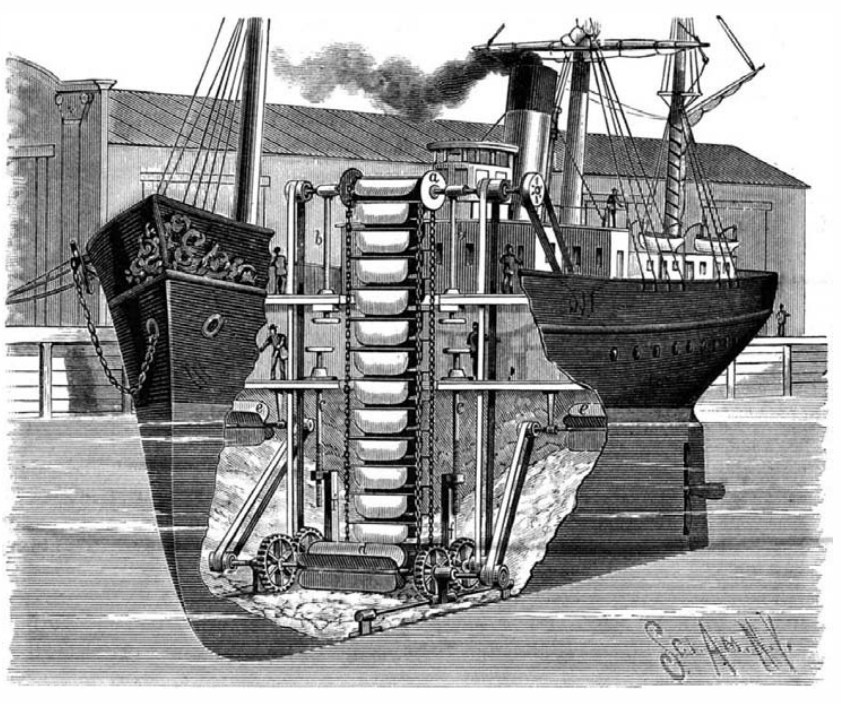
Professor Edland has communicated an important paper to the Royal Academy of Science, Sweden, in which he adduces further proof of his discovery that a perfect vacuum is a good conductor of electricity. This result is directly opposed to the current doctrine that a vacuum is a perfect insulator. The reason why a Torricellian vacuum is not traversed by an electric current is due to the fact that there exists at the points of the electrodes an obstacle to the discharge of the current, and this obstacle is augmented as the air is rarefied. If the current could be introduced into the vacuum without electrodes, it would be able to pass through the void without difficulty. The conclusion he arrives at from his recent elaborate experiments is that the maximum attained by the current intensity at a certain pressure of the air when a curent traverses a rarefied air space is not due in any way, as generally assumed, to the resistance between the electrodes by the air having its minimum at that pressure, and afterward increasing in amount with the increase of rarefaction, but to the fact that the sum of the electromotive of the spark and this resistance then possesses its minimum value. With the continuation of the rarefaction the resistance of the column of gas diminishes; but the electromotive force increases. Without employing electrodes at all, M. Edland can by induction easily excite luminous effects in a gas sufficiently rarefied to stop the passage of a powerful current from electrodes. But this would in his opinion be impossible if a highly rarefied gas were an insulator.

Imitation Stained Glass.

Among the many uses of the printing press none is more novel than the production of imitation stained glass. Designs for any pattern desired are engraved on wood. The blocks of wood are placed on an old fashioned hand press, and then are inked with oil colors compounded with special reference to the use for which they are intended. Then a sheet of very thin hand-made porous paper is laid on, and a prolonged impression given, in order that the color may thoroughly permeate the paper. Each color is, of course, printed at a separate impression. Having completed the printing process, the different pieces of paper which compose the design are soaked in warm water half an hour, taken out, the water sponged off, and then coated on one side with a thin cement. A similar coat of cement is given the glass to which the paper is to be applied, and then the paper is laid on in place, and varnished over. The plain glass window becomes at once, to all appearances, a window of stained glass. The effects of the lead lines, the irregular pieces of colored glass, the heads of saints and soldiers, the antique, or the modern Japanese designs are all to be had as brilliant in color as any imitation can be expected to be of the genuine glass. The glass thus prepared costs about one-tenth as much as genuine stained glass, and can, when it requires it, be washed without fear of injuring the surface.

IMPROVED GRAIN ELEVATOR.

The accompanying illustration represents a grain elevator designed to take all the grain out of the hold of a vessel without the aid of men. Journaled horizontally in standards, *b*, on the deck is a shaft provided with a central pulley, *a*, and a pulley at either end. Another shaft arranged with a central and end pulleys is journaled beneath the deck in arms, *f*, connected at their upper ends with vertically arranged screws, *c*, which work in corresponding nuts in the deck. An endless belt provided with buckets passes around the central pulleys working through openings in the deck. On the outer end of the lower shaft is a pulley, and a third shaft carrying a rotary shovel is also provided with a pulley, the two pulleys being connected by a belt. Cog wheels may take the place of the pulleys, as shown in the engraving. Upon power being applied to the upper shaft the endless belt will move, elevating the grain from the hold. The object of the rotary shovel is to bring the grain into such a position as to be readily taken up by the buckets. Other rotary shovels may be placed at suitable points, as *e e*. The standards, *b*, are provided with screws beneath the deck which work in threaded holes in the interior of the standards. These screws are provided with fixed collars secured to the deck in order to prevent the screws from slipping vertically; the standards are by this means raised or depressed. By means of the screws, *c*, and those just described, the elevator may be adjusted to any height.



BARDEEN'S IMPROVED GRAIN ELEVATOR.

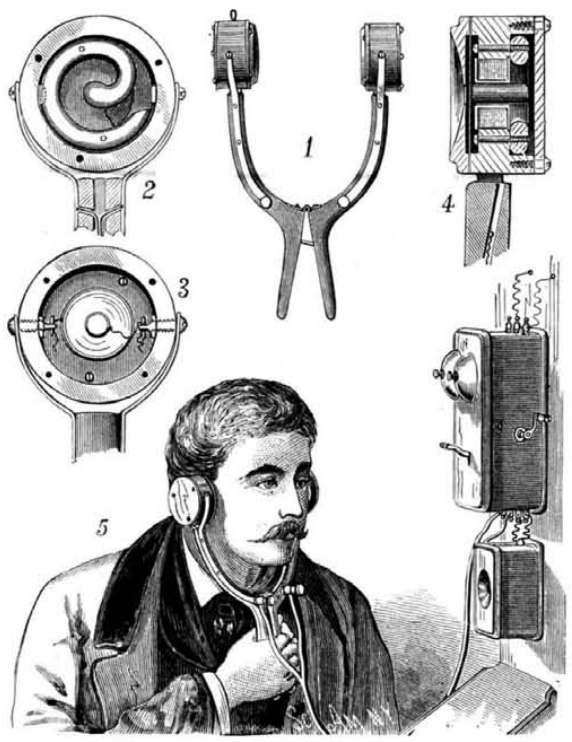
This invention has been patented by Amy Bardeen, of Blackstone, Mass.

Preserving Autumn Leaves.

The leaves may be pressed between sheets of blotting paper, which are changed at intervals, until the leaves are thoroughly dried, in order to prevent rotting. The colors then look dull, but may be brought out by either oil, a thin white varnish, or wax. The leaves may be rubbed with wax and carefully pressed with a warm, not hot, flatiron, and by carefully rubbing with the edge of the iron they may be made to curl most naturally.

ADJUSTABLE TELEPHONE RECEIVER.

In the telephone herewith illustrated, two curved rods are hinged to each other at the upper ends of the handle pieces, so that when the handles are pressed together the upper ends of the rods will be separated, as shown in Fig. 1. A spring attached to one handle piece rests against the other and presses them apart; a hook prevents the handles from moving too far from each other. To the upper end of each rod is attached a fork formed of two insulated metal bands, and in each fork is pivoted a cup in such a manner that the diaphragms face each other. The cups each contain a coil surrounding a magnet. Fig. 2 is a rear view of the



BARNARD'S ADJUSTABLE TELEPHONE RECEIVER.

cup, showing the magnet; Fig. 3 is a front view, with the diaphragm removed; and Fig. 4 is a vertical section. One end of the wire of the coil is connected with one of the strips forming the fork and the other end with the other strip. By means of a wire one strip is connected with the corresponding half of the hinge, and the other strip is connected with a binding screw on the rod. The line wires are attached to these binding screws.

The connecting wires pass through channels in the rods. To use the instrument (Fig. 5) the handle pieces are pressed together, thus separating the cups, when the head is passed between the rods; and upon the handles being slightly released the spring holds the cups closely against the ears. The current passes from one binding post through the corresponding wire to the coil, back to the hinge, through the wire to the other coil, and thence to the second binding post. The advantage of placing a receiver to both ears is apparent. The construction insures a fit against the ears of heads of all sizes. We have tried this receiver with most satisfactory results, the sounds being clear and loud, and entirely free from annoyances arising from local noises.

This invention has been patented by Mr. Daniel G. Barnard, of Winslow, N. J.

THE official returns show that the healthiest class of people in Great Britain are the inmates of prisons, where simple diet, regular hours, and exercise are compulsory. But the cases of insanity among the convicts are out of proportion to the number of other ailments. To commit a crime a man must be more or less mad.

The Armor Plated Ship not a Modern Invention.

An old book entitled "A Universal History," published by J. Coote, London, 1759, contains the following:

"The invention of ships is very ancient, since God himself gave the first model thereof to Noah, for the building of his ark, to save the human race from the waters of the deluge.

"The first celebrated ships of antiquity, besides this ark, are that of Ptolemy Philopater, which was 280 cubits long, 38 broad, and 48 high; it carried 400 rowers, 400 sailors, and 3,000 soldiers. That which the same prince made to sail on the Nile, we are told, was half a stadium long. Yet these were nothing in comparison with Hiero's ship, built under the direction of Archimedes; on the structure whereof Moschion, as we are told by Snellius, wrote a whole volume. There was wood enough employed in it to make fifty galleys; it had all the variety of apartments of a palace, banqueting rooms, galleries, gardens, fish ponds, stables, mills, baths, a temple of Venus, etc.

"It was encompassed with an iron rampart, eight towers, with walls and bulwarks, furnished with machines of war; particularly one, which threw a stone of 300 pounds or a dart 12 cubits long, the space of half a mile; with many other particulars related by Athenæus."

One of the above original books is now or lately was in the possession of James E. Serrell, C. E., of this city.

The United States Foreign Mail Service.

The annual report of the Superintendent of Foreign Mail states that the letter mail dispatched during the year increased 77 per cent over the amount sent in 1880, and the printed matter increased 74 per cent. The number of letters sent to countries not in the Postal Union, excluding Canada, was 410,600. The sum paid for sea transportation of mails was $316,322; of this amount $263,621 were paid for trans-Atlantic service; $19,251 for trans-Pacific, and $33,649 for West Indies, the Isthmus, and other routes. The estimated amount of postage collected in the United States on foreign mail matter was $2,078,913.

Death from Cold in Mammals.

The behavior of protoplasm under the influence of different degrees of temperature is still unsufficiently known. We are familiar with the general facts that excessive heat or cold brings about death, and that fever is attended with increased tissue changes; and in some measure we understand the kind of way in which this happens; but that is all. MM. Richet and Rondeau have studied the influence of cold on some mammals. They have adopted a method by which the temperature of animals has been gradually lowered. Dogs resist cold so well that no experiments were made on them. Rabbits were chiefly employed in these investigations.

These animals were shaved and surrounded with flexible pewter tubes, through which cold water was made to circulate. When the temperature of the body was lowered to 25° C., respiration began to be ineffectual. The rhythm was not modified; but the amplitude of the inspirations was chiefly diminished. The functions of the nervous system were much abated when the temperature fell to 17° C.; they were not, however, abolished. Reflex movements were obtained, even when the temperature sank to 15° or 14° C.; and the observers believe that the excitability of the nervous system disappeared not directly on account of the cold, but probably from arrest of the circulation. Spontaneous movements disappear before the reflex acts. The reflex from the cornea went before those from the lower limbs. At 16° C. the reflexes were remarkably slow and like those in animals with a cold circulation. Sensibility to pain was not abolished even at the temperature of 16° C. Cold gradually slowed the cardiac action.

The form of the contraction at 17° C. was like that of the heart of the tortoise. Systole commenced at the auricles, and by a slow vermicular movement passed on to the ventricles. Even although death had been apparent for half an hour, the animal could be restored to life; so that vitality can be recalled half an hour after the cessation of respiration and circulation. When the temperature was 19° C., it took more than ten minutes to asphyxiate the rabbit by blocking the trachea. We may conclude from this that tissue metabolism is correspondingly slow. The same animal was suffocated in four minutes at a temperature of 32° C.

MM. Richet and Rondeau commented on the similarity between the vital processes of hibernating animals and those of rabbits thus experimented upon, in which a condition, so to speak, of artificial hibernation may be induced.—*Lancet.*

Perosmic Acid

Is a new remedy employed by Professor Winiwarter in cancerous and scrofulous swellings. It is used by injecting daily three drops of a one per cent solution of the acid, which treatment causes the tumor to soften and decrease in size; the dead tissue is thrown off, and disappears in about a month. No curative effects upon cancer itself have been observed from the remedy.—*Rundschau, Leitm.*

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Inventions and Inventors.

The beginning of inventions is very remote. The first idea, born within some unknown brain, passes thence into others, and at last comes forth complete, after a parturition, it may be, of centuries. One starts the idea, another develops it, and so on progressively, until at last it is elaborated and worked out in practice; but the first not less than the last is entitled to his share in the merit of the invention, were it only possible to measure and apportion it duly. Sometimes a great original mind strikes upon some new vein of hidden power, and gives a powerful impulse to the inventive faculties of man which lasts through generations. More frequently, however, inventions are not entirely new, but modifications of contrivances previously known, though to a few, and not yet brought into practical use. Glancing back over the history of mechanism, we occasionally see an invention seemingly full born, when suddenly it drops out of sight, and we hear no more of it for centuries. It is then taken up *de novo* by some inventor, stimulated by the needs of his time, and falling again upon the track, he recovers the old foot marks, follows them up, and completes the work.

There is also such a thing as inventions being born before their time, the advanced mind of one generation projecting that which cannot be executed for want of the requisite means; but in due process of time, when mechanism has got abreast of the original idea, it is at length carried out, and thus it is modern inventors are enabled to effect many objects which their predecessors had tried in vain to accomplish. As Louis Napoleon has said, "Inventions born before their time must remain useless until the level of common intellects rises to comprehend them." For this reason, misfortune is often the lot of the inventor before his time, though glory and profit may belong to his successors. Hence the gift of inventing not unfrequently involves a yoke of sorrow. Many of the greatest inventors have lived neglected, and died unrequited, before their merits could be recognized and estimated. Even if they succeed, they raise up hosts of enemies in the persons whose methods they propose to supersede. Envy, malice, and detraction meet them in all their forms; they are assailed by combinations of rich and unscrupulous persons to wrest from them the profits of their ingenuity; and last, and worst of all, the successful inventor often finds his claims to originality decried, and himself branded as a copyist and a pirate.

Among the inventions born out of time, and before the world could make adequate use of them, we can only find space to allude to a few, though they are so many that one is not disposed to accept the words of Chaucer as true, that "There is nothing new but has once been old;" or, as another writer puts it, "There is nothing new but what has before been known and forgotten;" or, in the words of Solomon, "The thing that hath been is that which shall be, and there is no new thing under the sun." One of the most important of these is the use of steam, which was well known to the ancients; but though it was used to grind drugs, to turn a spit, and to excite the wonder and fear of the credulous, a long time elapsed before it became employed as a useful motive power. The inquiries and experiments on the subject extended through many ages.

Friar Bacon, who flourished in the thirteenth century, seems fully to have anticipated, in the following remarkable passage, nearly all that steam could accomplish, as well as the hydraulic engine and the diving bell, though the flying machine yet remains to be invented: "I will now," says the friar, "mention some of the wonderful works of art and nature in which there is nothing of magic, and which magic could not perform. Instruments may be made by which the largest ships, with only one man guiding them, will be carried with greater velocity than if they were full of sailors. Chariots may be constructed that will move with incredible rapidity without the help of animals. Instruments of flying may be formed in which a man sitting at his ease and meditating on any subject may beat the air with his artificial wings after the manner of birds. A small instrument may be made to raise or depress the greatest weights. An instrument may be fabricated by which one man may draw a thousand men to him by force and against their will, as also machines which will enable men to walk at the bottom of the seas or rivers without danger."—*Aldebaran, in the American Artisan.*

The Roman Baths at Bath, England.

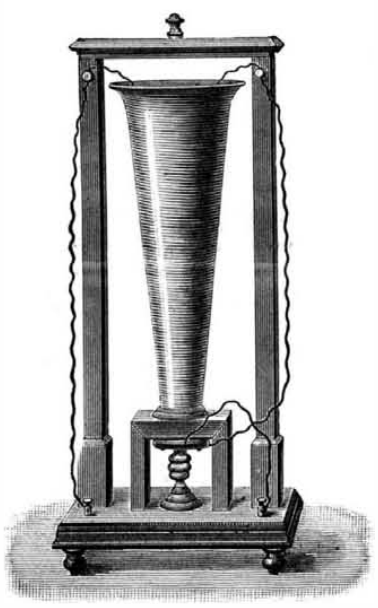
It is well known that the pleasant city and medicinal watering place called Bath was the Aquæ Solis of the Romans, when Britain was a province of their empire; and some interesting traces of their occupation of this place have been discovered from time to time during the past five years. The excavations begun by the Municipal Corporation have been carried on by the Bath Antiquities Committee, assisted by the London Society of Antiquaries and by private subscribers; but more funds are still required. The hot springs appear to have been protected, under Roman management, by an octagonal structure, built of massive stone and cased inside with lead, beneath the modern Pump Room.

The greatest discovery has been that of a large bath, 81 feet in length by 38 feet 10 inches in width, with steps complete at its four sides, floored with blocks of masonry, on which still remains the original coating of lead. The bath was supplied by the hot mineral water, and had a hatch or sluice of bronze (now deposited in the Pump Room) for conveniently emptying it. The bath is in the center of a large hall with *scholæ* all round, in length 110 feet, width 68 feet 6 inches. The floor of this hall is at a depth 20 feet below the neighboring street; above part of its site are the offices of the Poor Law Board, which have been underpinned and supported by arches, while other large buildings have been purchased and removed by the Corporation.

The ancient Roman masonry stands yet upward of 10 feet above the floor of the hall, which consists of three aisles, the center being the width of the bath, vaulted by a barrel vault. The vault sprang from an arcade of clustered pilasters, giving seven arches on either side. The pilasters, 2 feet in diameter, of solid block, stand on Attic bases and plain pedestals; the side aisles or *scholæ* were arched and groined, with attached pilasters along the walls and three recesses (*exedræ* or *stibadia*) 15 feet wide, on each side the hall; two being semicircular, and the third and central one square. In the center bay of the northern arcade is a defaced piece of sculpture, through which ran the water. Below the sculpture is a recess in the steps marking the position of a large sarcophagus (now lost), into which the water was first poured and so overflowed into the bath. The entrance to the great bath is at the western end, by a doorway from a large hall, the precise extent of which is unknown. Very fine fragments of architectural sculpture have been obtained; also a metal mask somewhat similar to those of Dr. Schliemann, several patens and ewers of metal, and an engraved tablet, another tablet in cursive character, a large number of coins, bones, and pottery, and lastly a teal's egg, evidently in the position it was laid by the bird against one of the ruined pilasters of the bath in the decayed vegetation; this little token of nature proves that the city of Aquæ Solis (Bath) continued a deserted ruin for a lengthened period after its destruction by the Saxons, A.D. 577.—*Illustrated London News.*

THE ELECTRO-MAGNETOPHONE.

At the Munich Exhibition of Electricity Mr. Weigele exhibited a series of interesting acoustic apparatus. Among these there was one called by the inventor an electro magnetophone. This instrument, which is shown in the accompanying cut, consists of a tin disk fixed at the bottom of a hollow cone, and having above it an electro-magnet, and beneath it a mercury cup into which dips a metallic point. When the current passes, the electro-magnet attracts the disk and breaks the contact with the mercury, the current ceases to pass, and the contact is set up again, so that the disk is set in motion in the same way as the vibrator of a Ruhmkorff coil. There may be thus obtained from 400 to 440 vibrations per second. The sound that is produced is very intense, and the inventor thinks that it will be possible to obtain in this way sounds loud enough to be employed as fog signals.—*La Lumiere Electrique.*



THE ELECTRO-MAGNETOPHONE.

"Doctoring" Hides and "Making Weight" in Leather.

The proportion of American tanners using East India hides is not great, but several large tanneries annually produce a good deal of leather therefrom, mostly used in the medium and common qualities of boots and shoes manufactured in New England. The high prices for all classes of hides, as compared with the rates for leather since 1879, have caused an unusually active demand for these cheaper East India goods, particularly of the heavier grades. But hides are only heavy according to the species and growth of the animals from which they may be taken. To make enough hides of the weights most desired, therefore, the natives have been pasting or plastering lighter ones with a mixture called in the trade "chenam"—variously compounded, but probably like the plaster "chunam." In this way American tanners have bought many tons of East India dirt, paying therefor the cost of good hides and freight charges, besides being put to no little expense in removing it from the hide. This practice has prevailed to some extent for many years, but it seems the very height of assumption on the part of the producers, and of foolishness on the part of the tanners, had been reached during the past season, when, as stated by the *Shoe and Leather Reporter*, Patna hides weighing an average of 10 pounds each have been sold thus "doctored" to weigh an average of 14 pounds. The "weighting" of salted hides, with the question of proper tare thereon to make an average of hides in properly merchantable condition, has always been the cause of much dispute between the tanners and our home hide producers, but we believe the latter have never yet attempted anything quite so audacious as seems to have been successfully carried out by the Oriental hide dealers.

In this connection it may not be inappropriate to refer to a related branch of the same subject. All tanners who make leather to sell by the pound are not as particular as they should be as to its quality, if only the appearance is as it should be. In sole leather the buyer can always judge pretty well as to what he is purchasing, though even here he is liable occasionally to be compelled to pay for a good deal more water than should be sold in properly merchantable goods. But when we come to harness leather, calfskins, and many kinds of upper stock for boots and shoes, the practice of overstuffing with cheap oils, to "make weight," is so general that those who follow the opposite practice may be said to form exceptions to the common rule. All large manufacturers, and many of the smaller ones, know this so well that it cannot be said to be generally a fraud as between the first bargainers, as is the case in the "doctoring" of hides, but the practice is quite as much to be deprecated as being not only a wasteful method of manufacture, but as really constituting a virtual deception of many of the less capable judges, and being an injury to the public.

Glucose vs. Cane Sugar and Sorghum.

When corn was so cheap at the West that it was in many places used as fuel in lieu of firewood, the glucose industry seemed all at once to blossom into full activity. This was a little over three years ago. The business had theretofore been conducted on a pretty large scale, but so quietly that the public in general had hardly any knowledge of such an industry until its attention was invited by the publication of full details relating thereto, in the course of an important and highly sensational lawsuit in the western part of New York State. The particulars then presented as to the extreme cheapness of production, at a time when corn was selling at 25 cents a bushel, and the extent to which it had been substituted and unwittingly used for cane sugar, though possessing only a small part of the sweetness of the latter, attracted universal attention, and had a twofold result. The first was to induce the investment of large amounts of capital in the manufacture of glucose sugar and sirup, extensive establishments therefor springing up in many places almost as if by magic. But the investors in this instance seem to have been a little too hasty. The public also had "seen the papers," and consumers generally had become acquainted with the difference between cane sugar and glucose.

It was quickly understood that an admixture of glucose in granulated sugars could be readily detected by the different appearance as to crystallization, while in the powdered and brown sugars, and in the beautiful sirups, where glucose had been largely used as an adulterant, people had only to have their attention called to the inferior sweetness of the glucose compounds to see the advantages of cane sugar. Manufacturers of confectionery, who were at first large users of the new product, discontinued its use to a great extent, certainly in all their better productions; the brewers, who had begun to employ it largely, have likewise almost entirely ceased therefrom, owing to the popular demand that they should do so, and no responsible merchant of any standing would now attempt knowingly to sell a sugar adulterated with glucose as the pure product of the cane. In this way, while the facilities for manufacturing glucose were being largely increased, the demand therefor was being diminished in a yet greater ratio. Many thousands of dollars have thus been utterly sunk by the investors, some large establishments being entirely idle, and others, owned by parties who at first attempted to buy up or crowd out opposition, doing only a small and unremunerative business.

With the present promising outlook for a large production, from sorghum, of sugar in no way distinguishable from that made from the sugar cane, there seems little probability that the glucose manufacture will ever again assume the important position it temporarily held, while the new industry gives every indication of "coming to stay."

Gilding Leather.

We find in the *Papierzeitung* the following method described for gilding leather. It is first moistened with a sponge, then stretched and tacked on a board. When dry it receives a coat of thick isinglass solution, then one of white of egg that has been beaten and allowed to settle. Upon this is laid lightly with a brush sheets of *silver foil*, which are then pressed down with a wad of cotton wool. When this is dry it is painted over with yellow leather varnish, which gives it a beautiful golden appearance.

A varnish for bronze boots and slippers is made by dissolving aniline red in shellac or other varnish. P. N.

Neuralgia Treated by the Tuning Fork.

Dr. Rasori applies the tuning fork, while vibrating, over the course of the painful nerve. The sitting usually lasts about half an hour, and the patient is generally relieved without further treatment. He records his method in the *Cinn. Lan. and Clin.*

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Correspondence.

Saving Life on Land and at Sea.

To the Editor of the Scientific American:

I have given some thought to two projects for saving life and property, and with your kind permission I will briefly describe them with the object of inviting discussion. One relates to the land and the other to the sea.

In reference to the first, I would say that in the frequent case of fires among warehouses and manufactories, I am led to believe that more damage is done to goods than to buildings. I would avoid this in a measure by making all the floors of warehouses perfectly tight, like the deck of a ship. I would provide, all round the rooms, waterways of metal with conduits to carry off water thrown in by engines. These conduits should lead into a cistern in or near the cellar or sidewalk, and thus save the water to be pumped up again if wanted; if the floor be properly laid on iron beams and made of plank thoroughly calked, and all floor openings duly surrounded by ledges, or "coamings" like the hatches of a ship, little or no water can get through to the floors below. I would have all brick stores plastered directly on the walls, dispensing with the laths entirely. As buildings are now constructed, much of the water poured into an upper story percolates through the floor and damages goods. Although the insurance brigade may be on hand and work diligently, many goods are damaged or spoiled. The expense of laying floors as alluded to will of course be greater than the common floors, which invite destruction, but the value of the tight floors would far more than overbalance the first cost. When we look at the massive, magnificent, palatial stores erected in late years, and see the dangerous floors and plastering, we cannot cease to wonder at the inconsistency between the polished granites and the laths and boards!

My project to save life and property at sea is simply to construct the watertight compartments of a ship as usual in first class vessels, and to pack all valuable goods in watertight packages of a form to stow close. Let me suppose that two or three of the main compartments in a steamer are filled with such packages; let us suppose that she goes on the shore and staves a hole in each compartment. Very little water would enter to fill up the small spaces between the packages, and every one of these packages, if duly immersed, instead of soaking up much water, destroying or damaging the contents, and *assisting to sink the ship* or to keep her on the rocks, would in a great measure *assist to float her*. And in the event of being compelled to lighten a ship by throwing over cargo, or landing goods in exposed places, the watertight packages would be saved. Objection has been made to the practicability (in a commercial sense) of carrying out my plan, principally on account of the extra cost. To this I answer, that if the goods are worth saving, the cost of tight packages is of little consequence. We see every day wine costing forty or fifty dollars put into well made casks costing perhaps four or five dollars; why not put into tight casks goods (now exposed in flimsy boxes) worth from $200 to $2,000?

In the days of the East India Company, all their valuable goods were packed in bales made perfectly watertight by layers of tarred canvas. I once picked up a bale of goods which had been in the water long enough to be covered by barnacles; the contents were as dry as the day they were packed! It was the custom in olden times when I went to Manila to pack goods in wooden boxes lined with copper well soldered. This, at first sight, would seem very costly; but, when it is considered that the copper went in free of duty, and was worth perhaps 25 per cent more than it cost, it will be seen that it was a cheap form of packing goods. I believe that the day is not far off when first class steamers will carry only first class passengers and first class goods—that is to say, only goods which can afford to be packed so that they will help to float the ship instead of helping to sink her. Good casks will be worth very nearly their cost, while boxes make only kindling wood.

Carry out my idea, and there will spring up at once manufactories where paper or wooden casks and watertight boxes will be made by the million.

The question of insurance has so many sides to it that I shall only touch upon it by suggesting that my idea will not be very popular with underwriters.

R. B. FORBES.

Milton, Mass., November 9, 1883.

The Mechanism of the Vertical Attitude.

Expression, which is translated by several different means —the cry, the look, the gesture, the play of the countenance, etc.—is nowhere more complex than in attitude, this permitting, better than any other expressive mode, of interpreting its most delicate shades.

This is especially true of the vertical attitude of man, which, co-ordinated, like that of animals, in view of equilibrium, is much more directly subordinated to the act that is being accomplished. It is especially advantageous in that it frees the upper members in view of the work to be done; and this sort of attitude is distinguished by the aptitude for work which results therefrom for man, much more than by the peculiarities of equilibrium and expression that characterize it. Nevertheless expression profits by this independence of the upper members, since these latter constitute the apparatus of gesticulation—gesture being one of the most expressive forms of language.

Attitude may be defined as the general aspect of the body *adapted* for equilibrium, action, or expression. Now this adaptation does not essentially differ in man and the lower animals. In both it necessitates an effort that exists neither in the cadaver nor the sleeping man, but which becomes evident as soon as the sleeper again takes possession of the external world. A displacement, however slight it be, of the center of gravity constitutes the body in a state of exertion, and such exertion assuredly becomes indispensabe in order that man may afterward raise himself erect upon his feet and hold himself in that position.

The co-ordination of attitude in the higher animals, and very likely in those that are lowest in the scale of being, requires, in the very first place, a more or less clear appreciation of the medium in which the animal is moving. With us the notion of this is furnished by our senses. The sense of touch gives us the notion of contact; a muscular sense warns us of the execution of a movement, while at the same time it conveys to us a notion of the changes that have taken place in our conditions of equilibrium (notion of gravity); and special sensations furnish us with the notion of the relation of objects, one of such notions being that of space.

The mutual interdependence of these different elements is such, in a normal state, that the inertia of one or the other of the apparatus of sensation or the absence of one or the other of these elementary notions often carries with it a disturbance of the attitude. In an unimpaired state of the sensations, roles are distributed in such a way as to compensate, in the movements generally, for certain superfluous wheels that have a double function. But these wheels are capable, when necessary, of taking the place of the others, and of alone bringing about a motion when the others are no longer in operation. The example of the deaf, of the blind, of the paralytic, etc., who, at an adult age, having lost one or another of their senses, can, by beginning again their sensorial education, manage to supply to a certain degree the missing sense, suffices to prove that none of the notions above enumerated is indispensable to a notion of the environment, although all contribute thereto, and that the surviving sensations are sufficient to make up for it in such measure as may be necessary.

Experiments upon animals have demonstrated the importance of tactile sensitiveness in the co-ordination of attitude. On comparing these with what we observe, in a normal state, among those that are lowest in the series, we shall be led to believe that attitudes, at least in what concerns equilibrium, are purely automatic, that is to say, they are established instinctively as a consequence of a sensorial impression and by virtue of reflex power alone. It is thus at least with some of them. Grimaces, contortions, convulsions caused by local pain, tickling, etc., are indeed attitudes that are purely automatic in the majority of cases, and these cases are sufficient to establish the importance of motions that are purely reflex in the co-ordination of attitude.

This is seen still better by an observation of the attitude and the motions generally of animals that have been deprived of brain. The experiments of Mr. Onimus have been peculiarly instructive in this respect. Under such conditions, the pigeon thrown into the air spreads its wings and flies, and a frog thrown into water swims, as if tactile sensitiveness were alone sufficient to determine attitude. In fact, the motion effected in the preceding case ceases in the surrounding medium only when the animal meets with an obstacle. Moreover, if a brainless frog, resting in equilibrium upon a board, be placed in the water, he will not swim, even though the board be drawn from under him; and, in order to set him in motion, his position of equilibrium must be disturbed. Analogous experiments have succeeded not only with frogs, but also with carp and ducks even.

It is difficult to trace clearly the role played by the will in the co-ordination of the attitude, and to determine with accuracy what are purely spontaneous attitudes and to distinguish them from those that are purely automatic. A large number of associated motions which formerly passed for spontaneous and voluntary ones are to-day considered as automatic, that is to say, they are produced mechanically, and sometimes irresistibly, as a consequence of a sensorial impression. Such, in the bird, is the action of smoothing its wings. Motions of this class are qualified as *acquired* automatism, in the sense that they are the result of imitation and habit, and are not transmitted by heredity, that they are not the result of a pure and simple evolution of the organs, and are not observed in young animals. Many attitudes belong to this class of motions. Among them there are some that are purely conventional, such as those of respect, salutation, etc., among different peoples. While these vary, in spite of the identity of feeling that calls them forth, it is because the motions that are combined to produce them are not fatally connected, as in the preceding, with the inciting sensation; and, on another hand, they are often established without reflection, and through a sort of machinal impulse, this giving them the character of automatism.

We may, then, recognize three categories of attitudes: (1) spontaneous, (2) automatic, and (3) conventional; and an attentive observation of each of these, and a discussion of their analogies and differences, will allow us to estimate the role played by the brain in determining an attitude.

As regards the spinal marrow, we know that the isolation of it from the brain by a transverse section does not prevent the production of co-ordinate motions which have even the character of voluntary ones, in that they are adapted for removing the irritated part from the exciting cause. This fact has been verified more especially in batrachians; but in man himself the reflex motions that are called forth, in cases where the spinal marrow is compressed beneath the compressed medullary region, possess the same character. Certain physiognomists have concluded from this that the instinct of self-preservation is localized in the spinal marrow. The celebrated experiment of Pflüger is familiar. On placing a drop of acetic acid on the upper surface of the animal's thigh, the corresponding leg was observed to bend so as to bring the foot into a position to rub the irritated point. The foot having been amputated before renewing the irritation, the animal began again the same motion; and then, as the footless leg could not reach the point of irritation, the animal, after a few moments of agitation, as if it were seeking, says Pflüger, a new means of accomplishing its designs, bent the other leg and succeeded with that. The same facts have been reproduced by other experimenters, and have led to the belief that there exists in the spinal marrow not only an instinctive power (Prochaska), but also a perceptive or psychical one (G. Paton, Pflüger).

What is there astonishing, then, that the spinal marrow should co-ordinate to itself alone motions in general that are adapted for equilibrium? It has, in fact, been ascertained that, in frogs for example, a normal attitude is maintained in cases where a transverse section of the marrow is made; and Schiff has even concluded that the latter possesses a true sensitiveness, which is called by Van Deen sensitiveness of reflection.—*Dr. A. Nicolas, in La Nature.*

How to Cook an Old Hen.

Prof. W. Mattieu Williams gives us in *Knowledge* his practical experience with elderly poultry, as follows:

I may mention an experiment that I have made lately. I killed a superannuated hen—more than six years old, but otherwise in very good condition. Cooked in the ordinary way she would have been uneatably tough. Instead of being thus cooked, she was gently stewed about four hours. I cannot guarantee to the maintenance of the theoretical temperature, having suspicion of *some* simmering. After this she was left in the water until it cooled, and on the following day was roasted in the usual manner, *i. e.*, in a roasting oven. The result was excellent; as tender as a full grown chicken roasted in the ordinary way, and of quite equal flavor, in spite of the very good broth obtained by the preliminary stewing. This surprised me. I anticipated the softening of the tendons and ligaments, but supposed that the extraction of the juices would have spoiled the flavor. It must have diluted it, and that so much remained was probably due to the fact that an old fowl is more fully flavored than a young chicken. The usual farm house method of cooking old hens is to stew them simply; the rule in the Midlands being one hour in the pot for every year of age. The feature of the above experiment was the supplementary roasting. As the laying season is now coming to an end, old hens will soon be a drug in the market, and those among my readers who have not a hen roost of their own will oblige their poulterers by ordering a hen that is warranted to be four years old or upward. If he deals fairly, he will supply a specimen upon which they may repeat my experiment, very cheaply. It offers the double economy of utilizing a nearly waste product and obtaining chicken broth and roast fowl simultaneously.

One of the great advantages of stewing is that it affords a means of obtaining a savory and very wholesome dish at a minimum of cost. A small piece of meat may be stewed with a large quantity of vegetables, the juice of the meat savoring the whole. Besides this, it costs far less fuel than roasting.

The wife of the French or Swiss landed proprietor, *i. e.*, the peasant, cooks the family dinner with less than a tenth of the expenditure of fuel used in England for the preparation of an inferior meal. A little charcoal under her *bain-marie* does it all. The economy of time corresponds to the economy of fuel, for the mixture of viands required for the stew once put in, the pot is left to itself until dinner time, or at most an occasional stirring of fresh charcoal into the embers is all that is demanded.

Method of Exhausting Drugs.

Mr. Alfred B. Taylor gives the following in the *American Journal of Pharmacy:*

The process consists in using a portion of the finished preparation (from a previous operation) to macerate and partially exhaust the drug before using the new portion of menstruum, and as there is no limit to the quantity of finished preparation that can be used where necessary, it is possible to exhaust completely the drug operated on.

For example, let it be required to make two pints of tincture of arnica flowers:

Take of Arnica flowers, in No. 20 powder.....6 oz. av.
Tincture of arnica flowers.....2 pints.
Diluted alcohol, a sufficient quantity to make...4 pints.

Moisten the powder with a pint of the tincture of arnica flowers, and macerate for twenty-four hours; then pack it firmly in a cylindrical percolator, and gradually pour upon it, first the remainder of the tincture of arnica flowers, and afterward diluted alcohol, until four pints of tincture are obtained.

The author has used this process with great advantage in making the fluid extract and the tinctures of cinchona.

SOME Arizona mining companies are about to use the electric light in their mines.

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Some New Alcohols.

The term *alcohol* was originally applied only to that volatile and intoxicating constituent of fermented and distilled liquors which imparts to them their peculiar value. It is always obtained by fermentation, and usually separated by distillation. It is very combustible, has a burning taste, and dissolves a great many substances that are insoluble in water.

In 1812 Taylor discovered another volatile substance, possessing the same remarkable solvent powers, and equally combustible. It was found in crude wood vinegar, and is often called wood spirits, but the chemist preferred to call it alcohol, adding the prefix "methyl," to distinguish it from vinous alcohol, now called ethyl alcohol. In time other substances were discovered more or less similar to the two above described, among which was fusel oil. The chief constituent of this has since been isolated and named amylic alcohol.

When organic chemistry had advanced sufficiently to render a classification of the known compounds, these substances were grouped together into a class in which were placed all substances of similar chemical composition, although quite unlike in physical properties. The characteristic of an alcohol is that it contains an atom of hydrogen united with one of oxygen (called hydroxyl), just as caustic potash and soda do, but where the latter has a metallic atom the alcohol has a group of carbon and hydrogen atoms, with one more than twice as many of the latter as of the former. Another characteristic of all normal alcohols is their power of forming aldehydes, ethers, and acids. Formic acid is made from methyl alcohol, and acetic acid from ethyl alcohol.

There are a whole series of well known alcohols in which the number of carbon atoms gradually increases from one to nine. Here a break occurs. The next one has sixteen atoms of carbon joined to thirty-three of hydrogen, and is called cetyl alcohol. Then another break, and an alcohol is known with twenty-seven atoms of carbon, called cerotyl alcohol. The former is found in spermaceti, the latter in Chinese wax.

The first nine are liquid at ordinary temperature, the others solid; and all, except the methyl and ethyl alcohols, are more or less oily. Until very recently the number of solid alcohols was very small.

There was every reason to expect that the long break in the series between nonyl alcohol, which has nine atoms of carbon, and sexdecyl or cetyl, which has sixteen, would some day be filled up, for within this space were three acids having respectively ten, twelve, and fourteen atoms of carbon each. Not long since F. Krafft announced that he had succeeded in preparing these and several others. Ordinary ethyl alcohol is easily oxidized and converted into an aldehyde, which by further oxidation passes into acetic acid. Alcohol $-$ H $=$ aldehyde $+$ O $=$ acid $C_2H_5HO - H_2 = C_2H_3HO + O = CH_3COOH$.

It is natural to suppose that human ingenuity can reverse the process, converting acids into aldehydes, and these again, by reduction, into alcohols.

Krafft first prepared the barium salt of *capric* acid, $C_{10}H_{20}O_2$, and mixed it with the formate of barium, then subjected the mixture to distillation under reduced pressure. The result was an aldehyde, $C_{10}H_{20}O$, which he then dissolved in ten parts of glacial acetic acid and added three or four parts of zinc dust at long intervals, heating to gentle boiling for a week. On pouring out the acid solution and adding water the acetic ether of the desired alcohol separated as an oil, which was rectified to purify it. The alcohol was obtained from it by saponification.

This normal decyl alcohol is a strongly refracting, intensely sweet smelling, unpleasant tasted, thick oily liquid, which crystallizes in large rectangular plates that melt at 7° C. (44½° Fahr.).

The dodecyl alcohol, $C_{12}H_{26}O$, was prepared from *lauric* acid in a similar manner. It was found to melt at 24° C. (75° Fahr.) and boil at 143½° C., under 15 mm. pressure.

Tetradecyl alcohol was made from *myristic* acid; it is also a solid alcohol, and melts at 38° C. (100° Fahr.).

The next alcohol of the series, $C_{16}H_{34}O$, was prepared from *palmitic* acid, and found to be identical with the natural cetyl alcohol.

Octadecyl alcohol, $C_{18}H_{38}O$, was prepared from *stearic* acid, as in the manner before described. It melts at 59° C. (138° Fahr.).

These five new alcohols are of interest in many respects; and it is to be hoped that Krafft will soon add the other missing alcohols, at least to the thirtieth member of the series. H.

A Live Walrus in London.

A live walrus has just been introduced to the Westminster Aquarium. This animal, which is about five months old, is believed to be only the second of its race which has been captured alive, and it was taken at its mother's breast. The steam whaler Polynia, which came into the Tay on Thursday week, brought it, and Captain Walker, who commands the ship, gives a most interesting account of the capture of the "infant." He states that the vessel was slowly steaming up Davis Strait less than a month ago when a full grown walrus was observed floating on the top of the water, apparently asleep. The captain shot the animal, and a boat was lowered to harpoon and save the body. While engaged in this work, the baby walrus, which had been sucking the sleeping mother, made its appearance, and was at once dragged into the boat. The little creature uttered terrible cries, which brought two male walruses to its rescue. They attacked the boat ferociously. Being armed with formidable tusks of more than 2 feet in length, they placed the boatmen in great jeopardy, and the Henry's "express" rifle, which had killed the mother of the baby, was again brought into requisition. This killed the two males. Captain Walker fed the creature on salmon, of which the ship laid in a stock, and on this food it flourished, becoming quite docile and a playmate with the sailors. The fact of the capture was telegraphed from the Shetlands, and on Wednesday, when the ship was expected in the Tay, there were agents from the American, German, and largest English exhibitions waiting in Dundee. The ship was boarded at sea by Mr. Farini, who acquired the animal for the Westminster Aquarium, and it had its first introduction to London public life on Saturday last. It was not seen to the best advantage, as it had been confined in a box, and, as it had not had the use of water, its skin was not in its natural state. The young walrus is between four and five feet long, is a male, and has beautiful scarlet eyes. It is now cutting its tusks, and this condition gives it as much pain as cutting teeth does a child, and the rubbing of the gums gave it evident ease. The creature has caught a little chill in coming from the extreme northern latitudes to our milder climate; but otherwise it is healthy, and gives promise of offering an opportunity for an interesting study of its race, which attains the length of 15 feet. It is fed entirely on fish. The walrus formerly taken was fed on pork, and came, therefore, to an untimely death. The tusks of the mother walrus are also exhibited.

A Gigantic Organ.

The largest organ probably ever constructed was lately completed at Ludwigsburg. It is destined for the cathedral church at Riga. There are in it 7,000 pipes, 124 stops, with pedals, etc., proportionately numerous. A very complete "swell" arrangement allows the increase and diminution of sound to be effected with singular perfection and delicacy of effects. The filling of the pipes could not be carried out by organ blowers, but is effected by machinery worked by a gas engine of 4 horse power. This organ is 20 meters high, 11 broad, and 10 deep (about 65½ ft., 36 ft, and 33 ft. respectively). The largest wooden pipe is 10 meters (32¾ ft.) high, and its cubic contents are 70·6 cubic feet; while by a curious contrast the smallest pipe is made only a centimeter and a half high, and is attached to the greatest one.

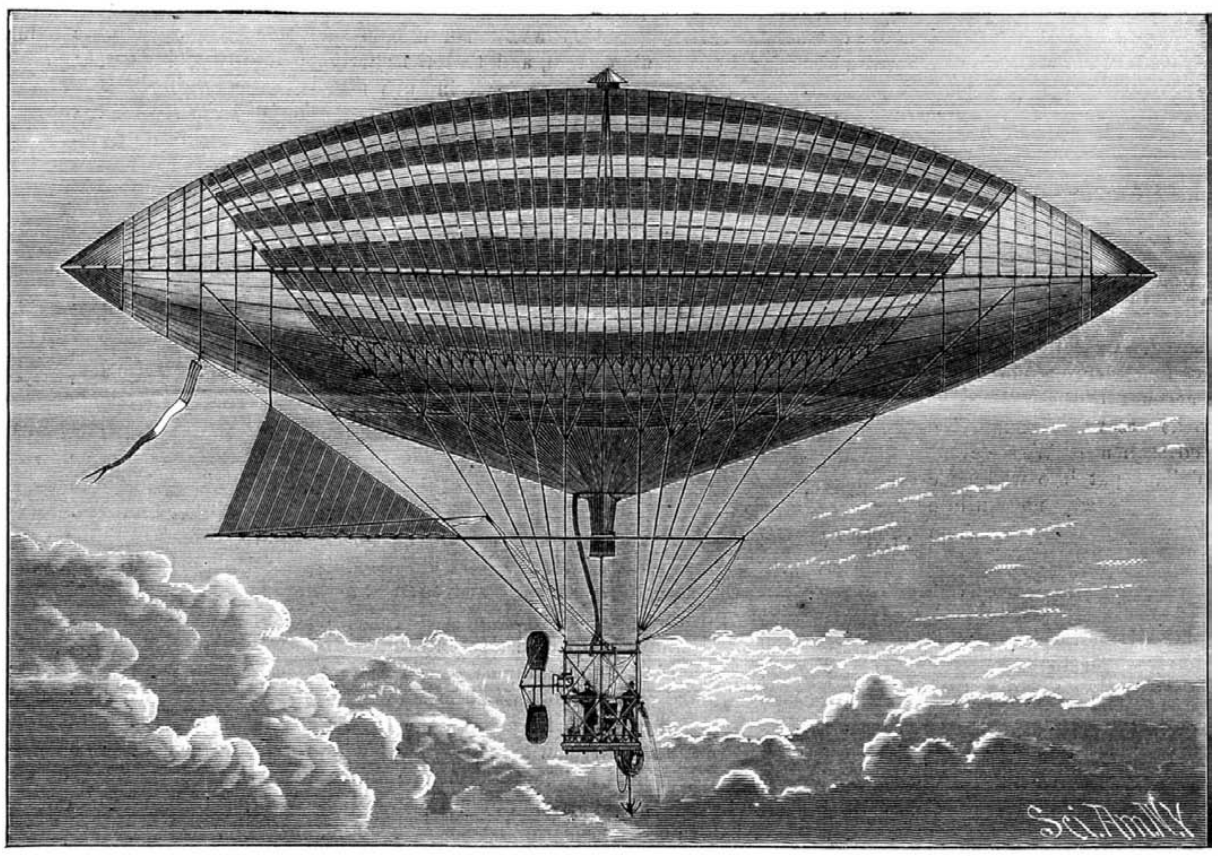
TISSANDIER'S ELECTRIC BALLOON.

The construction of the electric balloon included that of three distinct apparatus, to wit: 1. That of the balloon, properly so-called; 2. That of a hydrogen apparatus for inflating it. And 3. That of an electric motor designed for moving it by means of a screw which in revolving takes its purchase upon the air.

The construction of an aerial ship of elongated form presents serious difficulties, and can have as a guide only two previous experiments—that of Mr. Henri Giffard in 1852, and that of Mr. Dupuy de Lôme in 1872. In the small balloon that we operated at the time of the Exhibition of Electricity, says M. Gaston Tissandier in *La Nature*, we adopted as a mode of suspending the car a longitudinal rod beneath, like the one in Giffard's steam balloon. It has seemed to us since then that it would prove advantageous to place the helix behind a large parallelopipedic car that had sufficient height to protect the propeller against the danger of a shock on descending. The car, in this case, would be connected with the balloon by oblique suspension cords, and the affair would be prevented from getting out of shape by means of flexible rods fixed to the two sides of the balloon.

The construction of a balloon thus conceived was undertaken in the shops of Mr. H. Lachambre, who assumed the responsibility of manufacturing it. A small model of about 15 cubic meters capacity had previously been made, and it was only after studying the working of this in a captive state that the construction of the large one was begun

The electric balloon is in shape like those of Messrs. Giffard and De Lôme, and is 28 meters in extreme length by 9·2 meters in diameter at the center. It is provided beneath with a conical neck that terminates in an automatic safety valve. The fabric is percaline, this being rendered impermeable by a new varnish of excellent quality. The capacity of the balloon is 1,060 cubic meters. The suspension covering is formed of ribbons sewed to longitudinal elliptical pieces that keep them in the geometrical position that they are to occupy. The ribbons, thus arranged, fit perfectly to the inflated fabric and form no projections, as would be the case with a netting. We reproduce in Fig. 1 the diagram that was used for shaping the pieces of the balloon and the different parts of the suspension covering. This latter is fixed, at the sides of the balloon, to two lateral flexible rods, which follow its contours accurately from point to point, in passing along a line with its center. These rods are formed of thin walnut laths adapted to longitudinally-sawed bamboos, and strengthened by strips of silk. To the lower part of the covering is fixed a network that terminates in twenty suspension cords, which are attached in groups of five to the four upper angles of the car. The latter is cage shaped, and is constructed of united bamboos consolidated by cords and copper wires covered with gutta-percha. The lower part of the car is formed of cross-pieces of walnut which serve as a support for a basket work of osier. The suspension cords entirely envelop the car and are woven into the lower basket work. They had previously received a coating of rubber, so that, in case of accident, they might be preserved from contact with the acid contained in the car for supplying the piles. The suspension cords are connected horizontally by a ring of cordage situated two meters above the car.



TISSANDIER'S NEW ELECTRIC BALLOON.

The stoppage apparatus for descent (the guide rope and the anchor line) are attached to this ring, which, in addition, is designed for distributing the traction equally during a descent. The rudder, which is formed of a large surface of unvarnished silk held beneath by a bamboo, is affixed behind.

The following is the weight of the different parts:

Balloon, with valves	170	kilogr.
Suspension covering, with rudder and suspension cords	70	"
Lateral flexible rods	34	"
Car	100	"
Motor, helix, and piles, with the liquid for operating them during two and a half hours	280	"
Stoppage apparatus (anchor and guide rope)	50	"
Weight of fixed material	704	"
Two excursionists and instruments	150	"
Weight of ballast	386	"
Total	1,240	kilogr.

The ascensional force, reckoning 10 kilogrammes excess for the ascension, was 1,250 kilogrammes. The capacity of the balloon being 1,060 cubic meters, the gas therefore gave

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an ascensional force of 1,180 grammes per cubic meter, a result that had never before been obtained with preparations of hydrogen on a large scale.

From the end of September the gas apparatus was ready to operate, the balloon was stretched out upon the ground, under a long movable tent, so that it could be at once inflated; the car and motor were stored away under a shed, and my brother and I only awaited fine weather in order to perform our experiment.

On Saturday, the 6th, a high barometer was noted, and on Sunday, the 7th, the weather became fine, with a slight wind, and we therefore decided that the experiment should be made the next day, Monday, October 8.

The inflating of the balloon was begun at 8 o'clock in the morning, and was continued uninterruptedly until half-past two in the afternoon. This operation was facilitated by the equatorial cords which hung from the right and left of the balloon, and along which were let down the bags of ballast. These cords are shown in Fig. 2, which gives a front view of the balloon. The aerial ship having been completely inflated, the car was at once fixed in place along with the ebonite reservoirs, each containing 30 liters of acid solution of bichromate of potash. At twenty minutes past three, after piling up the ballast in the car and balancing the latter, we slowly ascended into the air through a slight E.S.E. wind.

At the surface the wind was nearly null, but, as frequently happens, it increased in velocity with the altitude, and we ascertained by the movement of the balloon over the earth that it attained at a height of 500 meters a velocity of 3 meters per second.

My brother was specially occupied in regulating the ballast in order to keep the balloon at a constant altitude, and not far from the surface of the earth. The balloon hovered over the earth very regularly at a height of four or five hundred meters. It remained constantly inflated, and the gas in excess escaped through expansion by opening, under its pressure, the lower automatic safety valve, the operation of which was very regular.

A few minutes after the start I operated the battery of bichromate of potash piles, which was composed of four troughs of six compartments each, forming 24 elements mounted in tension. A mercurial commutator permitted us to operate at will six, twelve, eighteen, or twenty-four elements, and to thus obtain four different velocities of the helix that varied from 60 to 180 revolutions per minute. With 12 elements in tension we found that the speed of the balloon in the air was not sufficient, but over the Bois du Boulogne, when we set our high speed motor running, by means of 24 elements, the effect produced was entirely different. The forward motion of the balloon suddenly became perceptible, and we felt a fresh breeze that was produced by our horizontal movement. When the balloon was facing the wind, its front point then being directed toward the steeple of the church of Auteuil near our starting place, it held its head to the aerial current and remained motionless—a fact that we ascertained by taking datum points on the earth under our car. Unfortunately, it did not long remain in this favorable position, but after operating well for a few instants, became suddenly subjected to gyratory motions that the play of the rudder was powerless to completely master.

Despite such rotations, which we shall find a means of avoiding in future experiments, we began the same maneuver again for more than twenty minutes, and this permitted us to stand perceptibly stationary over the Bois du Boulogne. When we endeavored to move forward, in cutting the wind in a direction perpendicular to that of the aerial current, the rudder inflated like a sail and the rotations occurred again with much more force. We infer from these facts that the position that an aerial ship should occupy should be such that its larger axis makes with the line of the wind only an angle of a few degrees.

After performing the experiments that we have just described, we stopped the motor, and the balloon then passed over Mont Valerien. After it had once become accustomed to the behavior of the wind we again set the screw in operation, and ran this time in the direction of the aerial current. The speed of the balloon was thus increased, and by the action of the rudder we then easily swerved to the right or left of the wind. We ascertained this fact by taking, as before, datum points upon the earth below. Moreover, several observers at the surface verified it.

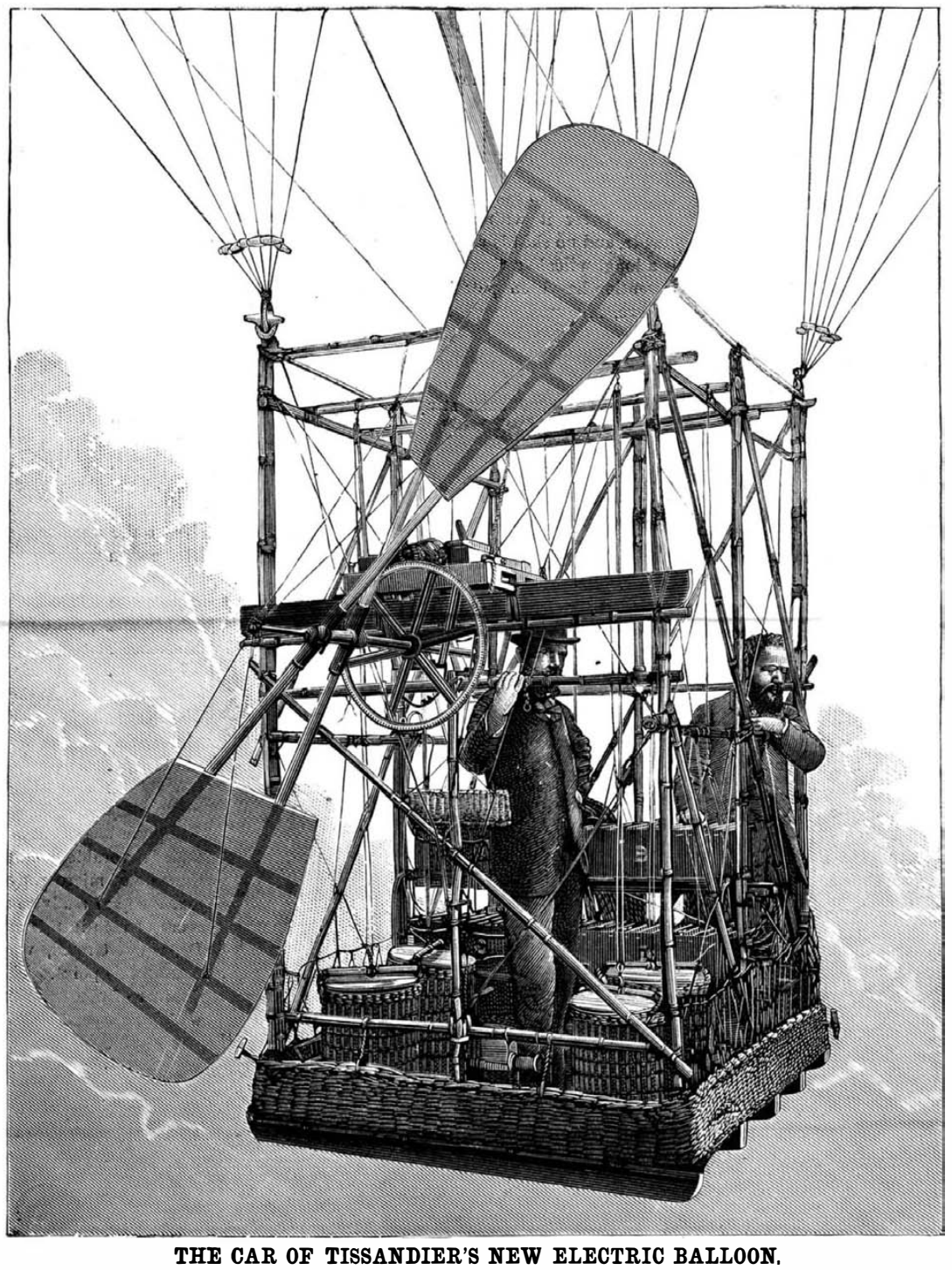
At thirty-five minutes past four we effected our descent upon a large plain in the neighborhood of Croissy-sur-Seine, where the maneuvers connected with landing were performed by my brother with complete success. We left the balloon inflated all night, and, on the next morning, it was found not to have lost the least quantity of gas, but was as fully inflated as on the preceding eve.

We would have liked to begin a new ascension on the same day, but the cold had, during the night, cause the crystallization of the bichromate in our reservoirs, and the pile, which was far from being used up, was thus not in a state to work. We had the balloon moved to the banks of the Seine near Croissy, and here, to our great regret, we had to proceed to empty it and lose in a few seconds all the gas that we had taken so much pains to prepare.

Without entering longer into any details on the subject of our return, we may conclude from this first experiment the following facts: that electricity furnishes a balloon with one of the most favorable of motors, the management of which in the car is extremely easy; that, in the particular case of our own balloon, when our helix, of a diameter of 2·8 m., was revolving at the rate of 180 times per minute, with an effective work of 100 kilogrammeters, we succeeded in holding head to a wind of 3 meters per second, and, upon descending the current, in swerving from the line of the wind with the greatest ease; and that the mode of suspending a car to an elongated balloon by oblique straps held by means of flexible rods at the sides secures a permanent stability to the system.

We must add that our ascension of October 8 should be only considered as a preliminary trial trip, which will be renewed along with such improvements as our material permits of. We must especially observe that we had in our car a considerable excess of ballast, and that it will be easy for us, hereafter, to employ a much more powerful motor.

Aerial navigation will not be created all at once, for it necessitates numerous trials, multiple efforts, and a perseverance that is proof against everything.



THE CAR OF TISSANDIER'S NEW ELECTRIC BALLOON.

THE town of Butler, Pa., uses natural gas for illumination and for fuel. The whole town is supplied by one well.

Potato Digger's Disease.

Dr. W. Zenker, of Stettin, has recently given a description (*Berliner Med. Wochenschrift*) of a "new disease" which affects farm laborers, particularly those engaged in digging and gathering potatoes. Dr. Zenker calls it a "new disease" in the sense that it has not before been described. He believes, however, that it must have existed for a long time among the peasantry of Germany and all agricultural regions. The disease is thought to be a neurosis of the locomotor apparatus of the feet and legs, the thighs and trunk not being affected. It is caused by the peculiar strained position into which the legs and feet are thrown while digging and gathering potatoes. The laborer, says Zenker, stoops down and supports himself upon the knees and feet. He moves about in this position with the knees strongly bent and feet strongly extended, and he keeps at this for hour after hour for many successive days. The position is not a natural or easy one, and any beginner who attempts it will soon feel a weariness and numbness in the limbs.

The result of this kind of labor is that in some cases one or both feet and legs become paretic, the paresis affecting both motion and sensation. The patient finds that one extremity feels heavy, cold, numb, and sometimes painful, and the foot drags in walking. The physician on examining it finds that the movements of flexion and extension are slow and weak. Lateral motion is limited. The affected leg feels colder to the touch than the healthy one. Tests show a loss of pathic and tactile sensation almost complete. In some cases electric currents are but slightly felt, while both faradic and galvanic reactions, though present, are feebler than normal. The leg does not atrophy.

A case of this kind may rapidly improve, or it may continue almost *in statu quo* for several years; the patient still walks about, though with a limping gait. The treatment has, so far, consisted in foot baths, massage, and electricity. It has not always proved successful.

Dr. Zenker reports in detail only five cases, but he believes that the disease cannot be a very rare one in the autumn months, and begs that other physicians practicing in the country will report the results of their observations.

We are unable to say whether any such affection as Zenker describes exists in this country. It has not been described as yet in any American text book. It would be a matter of interest to know whether any of our readers have come across the disease.—*Medical Record.*

Green Sunlight.

The green sunlight recently seen in India was, it appears, observed in Ceylon from September 9th to 12th. One correspondent writes to the Ceylon *Observer:* "Paleadierakam, September 12.—I write this from the above place on my way to Trincomalee, being much interested to learn whether the same phenomena exist thoughout the island. The sun for the last four days rises in splendid green when visible, *i. e.*, about 10 degrees from the horizon. As he advances, he assumes a beautiful blue, and as he comes further on looks a brilliant blue, resembling burning sulphur. When about 45 degrees, it is not possible to look at it with the naked eye, but, even when at the zenith, the light is blue, varying from a pale blue early to a bright blue later on, almost similar to moonlight even at midday. Then, as he declines, the sun assumes the same changes, but *vice versa.* The heat is greatly modified, and there is nothing like the usual hot days of September. The moon, now visible in the afternoons, looks also tinged with blue after sunset, and as she declines assumes a most fiery color 30 degrees from the zenith. The people are in terror at these phenomena, some even expecting the end." The correspondent asks, "Can this be the result of the eruption in the Sunda Straits?"

Salicylic Acid to Avoid Variola.

The editor of the *Southern Clinic* certifies, along with Dr. Claridge and Dr. De Cailhol, to the abortive power of salicylic acid in variola, given in the ordinary doses. Dr. Bryce thus concludes: "I believe salicylic acid used early and freely will place small-pox in the category with measles, chicken-pox, and other trifling complaints.—*Louisv. Med. News.*

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Early Stage of Inebriety.

There are found in all parts of the country men and women who use alcohol regularly and in limited quantities. To the casual observer they go on for years in this state and are apparently no worse, and finally die at last of some common disease, leaving the reputation of having lived what the inebriate would call an "ideal life" of moderate drinking. Why they drink is not clear. If they have any reasons, it is always sustained by their unbounded faith in the capacity to abstain at any time at will. These cases are inebriates in every respect, except in the prominence and intensity of the symptoms. There is no difference between the chronic case of the lowest type and the highly respectable, moderate drinker, except one of degree.

Both are suffering from a positive physical disease. In one case the disorder is developed, in the other it is in the incipient stage. In the latter, from some obscure reason, the case never goes on to full development, but is always on the "border land," awaiting the action of some exciting cause, which may or may not be applied. A repelling power exists, which builds up and neutralizes the injuries received from alcohol to a certain extent. It is not will power which makes the difference between the inebriate and moderate drinker. It is physiological and pathological conditions of the brain and nervous system, which the possessor ascribes to will power. Alcohol cannot be used in moderation without grave injuries to the nerve centers.

The moderate drinker is always diseased, although to the non-expert there are no clear symptoms or coarse lesions that can be seen. A careful study will reveal physically an irritable condition of the heart, with stomach and digestive troubles, also changing and disordered functional activity of all the organs, at times. Psychically the disposition, habits, temper, and mental state slowly and gradually degenerate and become more unstable. The higher mental forces drop down or give place to lower motives and ambitions. No matter what his position of life may be, or his objects or plans, the moderate use of alcohol will alter and break down both physical and psychical energy and precipitate destruction. Moderate users of alcohol always die from diseases provoked and stimulated by this drug. They always transmit a legacy of defective cell energy and exhaustion, which most readily finds relief in any alcohol or narcotic.

But only a small per cent of moderate drinkers remain so until death. The disease goes on to full development in inebriety, in a vast majority of cases. The boasted will power to stop at all times is powerless before its peculiar exciting cause. Those who never go beyond this moderate use have simply never been exposed to this peculiar exciting cause. The moderate use of spirits for a lifetime is a mere accident in the order of nature, and the ability to stop, resting in the will power, is a popular fallacy. A certain number of cases have signs of incipient phthisis, which may never burst out into the full disease.

A small number of cases exposed to small pox, or any infectious disease, never take it; but these are the rare exceptions, whose causes are unknown, from which no deductions can be drawn. Moderate drinking that does not go on to inebriety is also the exception. The chain of exciting causes that bring on these extreme stages may or may not be understood, but they always break out sooner or later in the history of the case. Practically the study of this early stage of inebriety is of the utmost value in the treatment. Here remedial measures can be made of the greatest avail in checking and preventing any farther progress of the disease. When inebriety is fully recognized as a diseased condition, requiring study and medical care, this prodromic period of moderate drinking will receive the attention it deserves.

In the mean-time, as scientific men, we must continue to call attention to this early beginning of inebriety, so full of indications and hints of the march of disease, whose progress and termination can often be predicted with positive certainty.—*Journal of Inebriety.*

Heathen Chinee Telegraphs.

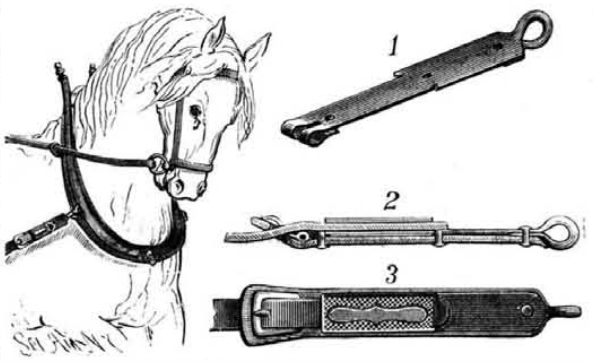
Owing to the peculiarity of the Chinese characters, each of which represents a word, not a letter, as in our Western tongues, the Danish Telegraph Company (the Great Northern) working the new Chinese lines have adopted the following device. There are from five to six thousand characters or words in ordinary Chinese language, and the company have provided a wooden block or type for each of these. On one end of this block the character is cut or stamped out, and on the other end is a number representing the character. The clerk receives a message in numbers, and takes the block of each number transmitted and stamps with the opposite end the proper Chinese character on the message form. Thus a Chinese message sent in figures is translated into Chinese characters again and forwarded to its destination. The sending clerk, of course, requires to know the numerical equivalent of the characters or have them found for him.

The Yellowstone Geysers.

The London *Times* says "that at the first glimpse it is uncertain whether the scene around the Yellowstone geysers resembles more a factory or visions of the Inferno. The roads are toilsome and perilous. The alkali, lime, and sulphur dust is knee deep. The hotels are gypsy encampments with the prices of Saratoga palaces, and without their civility. Anything like a picnic in this seared and scarred land appears equally out of place with a picnic by the Dead Sea."

HAME TUG.

The hame tug clip, Fig. 1, is folded at its forward end to form the eye in which the ring of the hame of the harness is placed. At its rear end the clip is folded under and slotted for receiving the buckle that holds the draught tug, as shown in Fig. 3. The rear part of the clip is made narrower than the fore part, for the purpose of enabling the offsets to be formed at the edges of the clip in order to prevent the box loop from forward movement when in place upon the hame clip. The box loop is prevented from backward movement upon the hame clip by coming against the folded part. The leather lining of the hame clip is secured by rivets which hold the folded end of the clip. The lining is cut away at its rear end to form an opening, through which the draught tug passes to the buckle, which is supported by the lining so that it will not come in contact with the tug, to wear and cover it with rust. The tug is easily and quickly made, and no skill is required in putting it together. Fig. 2 is a longitudical section of the hame tug.

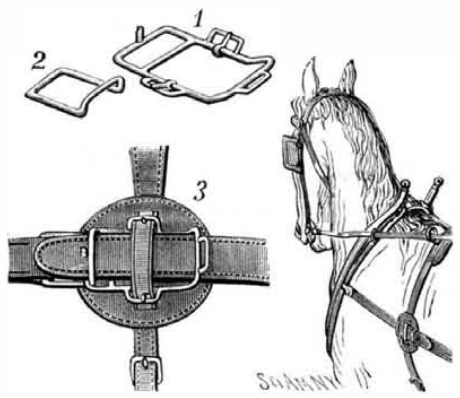


LELIE'S HAME TUG.

This invention has been patented by Mr. E. C. Lelie, of St. Genevieve, Missouri.

TRACE BUCKLE.

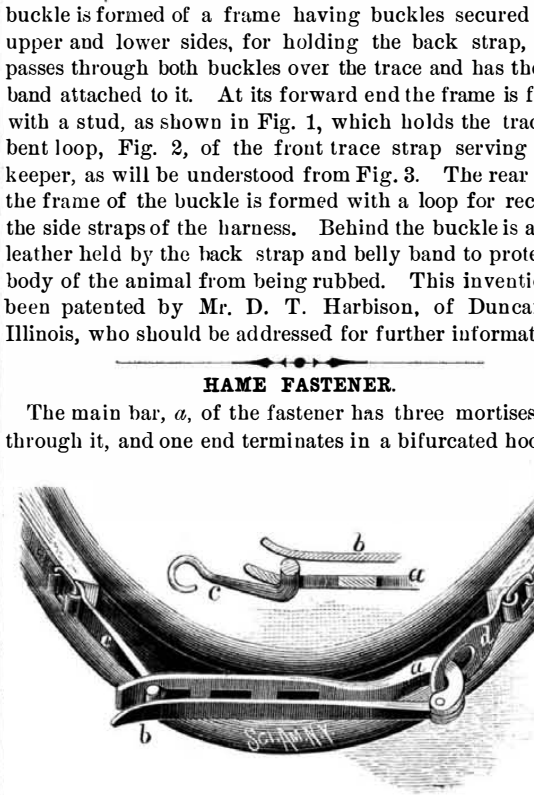
This buckle is adapted to hold the trace and the front trace strap, and also the back strap and belly band. The buckle is formed of a frame having buckles secured to its upper and lower sides, for holding the back strap, which passes through both buckles over the trace and has the belly band attached to it. At its forward end the frame is formed with a stud, as shown in Fig. 1, which holds the trace, the bent loop, Fig. 2, of the front trace strap serving as the keeper, as will be understood from Fig. 3. The rear end of the frame of the buckle is formed with a loop for receiving the side straps of the harness. Behind the buckle is a chafe leather held by the back strap and belly band to protect the body of the animal from being rubbed. This invention has been patented by Mr. D. T. Harbison, of Duncanville, Illinois, who should be addressed for further information.



HARBISON'S TRACE BUCKLE.

HAME FASTENER.

The main bar, *a*, of the fastener has three mortises made through it, and one end terminates in a bifurcated hook between the members of which the hook lever, *b*, is pivoted by a rivet or bolt. The bar, *d*, is formed with a mortise and hook as shown, the hook being intended to pass through and be secured to the link at the bottom of the ordinary iron, or wood bound, hame. The hook may be lengthened and twisted, or turned at a right angle to the mortise, and made so as to pass through the holes in a common wooden or plow hame. At *c* is represented a bar formed with a toggle at one end and a hook at the other, the hook serving the same purpose as the hook on the bar, *d*. The toggle is used to connect the bar, *c*, with the main bar, *a*, and for bringing the hames nearer together at the bottom by passing it through one or the other of the mortises. Both the bars, *d* and *c*, may be made of folded and bent round wire. To use the fastener the hooks of both bars are passed through the links at the bottom of the hames, the toggle is placed in one of the mortises, and then the lever, *b*, is passed through the mortise in the bar, *d*, and brought down against the main bar, drawing the hames together.



JONES' HAME FASTENER.

This invention has been patented by Mr. B. F. Jones, of Beauregard, Miss.

"Can Human Blood be told from that of the Dog?"

BY C. H. STOWELL.

In a recent case on trial at Wellsboro, Pa., Dr. Thad. S. Up de Graff, of Elmira, N. Y., swore very positively on this point. The newspapers give Dr. Up de Graff the credit of convicting the prisoner. It is not the proper place here to determine whether the prisoner was guilty or not; it is in the precincts of this journal, however, to determine whether the expert testimony was according to facts. Dr. Up de Graff was given some of the stained clothing to examine, and by processes entirely unknown to the writer (according to all accounts seen), by decantations, washings, etc., some corpuscles were procured and measured. Dr. Up de Graff positively testified that this was human blood and not dog's blood. When asked if he was the only one who could tell this, he replied that "there were but *four* men in the world who could tell human blood from dog's blood;" and of course he was one of them. When asked why he could do so much better than others, the reply was, "On account of the superior character of his glasses, and that his microscope cost sixteen hundred dollars." The testimony of Dr. Up de Graff makes him give a positive size to the human red blood corpuscle. What do standard writers say on this subject?

Gulliver says they are the $\frac{1}{3200}$ of an inch.
Flint says they are the $\frac{1}{3100}$ of an inch.
Dalton says they are the $\frac{1}{3731}$ to $\frac{1}{3050}$ of an inch.
Richardson says they are the $\frac{1}{3378}$ of an inch.
Woodward says they are the $\frac{1}{3092}$ of an inch.
Frey says they are the $\frac{1}{2840}$ to $\frac{1}{4630}$ of an inch.
Welcker says they are the $\frac{1}{3230}$ of an inch.

Where is the exact size to judge by? The red corpuscles are also subject to change in size by the varying changes in the blood and by many drugs. Wagner, in his General Pathology, gives a long list of remedies that when administered change the size of this corpuscle. How delicate is it, also, to the various reagents used in microscopical work! I have seen red corpuscles as small as the $\frac{1}{5000}$ of an inch, and as large as the $\frac{1}{2800}$ of an inch. I have never measured red blood corpuscles in lots of fifty each and had any two exactly alike, although using a delicate cobweb eye piece micrometer and a one-fiftieth objective.

Listen to what Mr. Woodward, of Washington, says: "The average of all the measurements of human blood I have made is rather larger than the average of all the measurements of dog's blood. But it is also true that it is not rare to find specimens of dog's blood in which the corpuscles range so large that their average size is larger than that of many samples of human blood."

Human blood cannot be told from dog's blood, except under favorable conditions, and not invariably then. For the sake of microscopy it is a pleasure to know that only *four* men are ready to make such statements. There are a score of men in this country with glasses equal, at least, to Dr. Up de Graff's, who would testify directly opposite to him on this point. If Dr. Up de Graff is ready to receive a number of pieces of cloth, labeled and stained, respectively, with human and dog's blood, under favorable and unfavorable circumstances, this journal will see to it that said cloths are prepared with accuracy by competent parties. If he succeeds, he shall receive all the glory these columns can sound forth, but if he fails he will be referred gently to his Wellsboro testimony.—*The Microscope.*

Photography of Moving Objects.

The dry plate process and special arrangements of the camera, by which exceedingly brief exposures are possible, have enabled the photographer to take views of rapidly moving objects. With particularly sensitive plates some startling results may be obtained, and not only can moving animals and vessels be photographed, but the spokes of the wheel and the fast trotter can be shown with sharp and distinct outlines. Even views from the windows of a quick train can be obtained. The necessary time of exposure has been reduced to such a small fraction of a second that absolute steadiness of the camera itself no longer enters into the problem. The dry plates are gradually driving out the wet ones in the galleries, and those who pose in uncomfortable positions are no longer in danger of being tired out. The artist no longer finds it essential to tell his patrons to "look pleasant," but he aims to tell them something interesting, when the natural expression comes over the face and is instantly caught by the camera. The taking of the baby's picture is no longer accompanied by dread. Much of the best work done with the dry plate process has been by amateurs.

Sulpho-Carbolate of Soda for Bee Stings.

Dr. Thomas Edwards, in the *Lancet*, September 22, 1883, says that in a case of great swelling of the face from the sting of a bee he gave fifteen grains of this drug in an ounce of water every four hours, with most gratifying results.

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Sleeplessness.

Nothing lowers the vital forces more than sleeplessness, which may generally be traced to one of four causations: (1) Mental worry; (2) a disordered stomach; (3) excessive muscular exertion; (4) functional or organic disease. Loss of sleep is, when rightly understood, one of Nature's premonitory warnings that some of her physical laws have been violated. When we are troubled with sleeplessness, it becomes requisite to discover the primary cause, and then to adopt suitable means for its removal. When insomnia, or sleeplessness, arises from mental worry, it is indeed most difficult to remove. The best and perhaps only effectual plan under such circumstances, says a writer in *Chambers's Journal*, is a spare diet, combined with plenty of outdoor exercise, thus to draw the blood from the brain; for it is as impossible for the brain to continue active without a due circulation of blood, as it is for an engine to move without steam.

When suffering from mental distress, a hot soap bath before retiring to rest is an invaluable agent for obtaining sleep, as by its means a more equable blood pressure becomes established, promoting a decrease of the heart's action and relaxation of the blood vessels. Many a sleepless night owes its origin to the body's temperature being unequal. In mental worry, the head is often hot and the feet cold, the blood being driven to the brain. The whole body should be well washed over with carbolic soap and sponged with *very* hot water. The blood then becomes diverted from the brain, owing to an adequate diffusion of circulation. Tea and coffee should not be taken of an evening when persons suffer from insomnia, as they directly induce sleeplessness, being nervine stimulants. A sharp walk of about twenty minutes is also very serviceable before going to bed.

Sleeplessness is sometimes engendered by a disordered stomach. Whenever this organ is overloaded, its powers are disordered, and wakefulness or a restless night is its usual accompaniment. Dr. C. J. B. Williams, F.R.S., remarks that no food should be taken at least within one hour of bedtime. It cannot be too generally realized that the presence of undigested food in the stomach is one of the most prevailing causes of sleeplessness.

Persons suffering from either functional or organic disease are peculiarly liable to sleeplessness. When inability to sleep persistently occurs, and cannot be traced to any perverted mode of life or nutrition, there is good reason for surmising that some *latent* malady gives rise to so truly a distressing condition. Under these circumstances, instead of making bad worse, by swallowing deadly sleeping drugs, a scientific physician should be without delay consulted. Functional disorders of the stomach, liver, and heart are often the primary source of otherwise unaccountable wakefulness.

Recently, the dangerous and lamentable habit of promiscuously taking sleeping draughts has unfortunately become very prevalent, entailing misery and ill health to a terrible degree. Most persons addicted to this destructive practice erroneously think that it is better to take a sleeping draught than lie awake. A greater mistake could hardly exist. All opiates more or less occasion mischief, and even the state of stupefaction they induce utterly fails to bring about that revitalization resulting from natural sleep. The physiological effect of hypnotics, or sleeping draughts, upon the system is briefly as follows: (1) They paralyze the nerve centers and disorder the stomach, rendering it unfit for its duties; witness the sickness and loss of appetite consequent upon a debauch. Chloral, chloroform, opium, etc., act upon the system much in the same way as inebriation. (2) One and all anæsthetics introduced into the body have *life* destroying properties in a low degree—proved by an overdose being fatal. (3) The condition they produce is not sleep, but a counterfeit state of unconsciousness. (4) They directly poison the blood, consequent upon its carbonization, resulting from their action. While speaking of sedatives, we cannot omit drawing special attention to chloral. This powerful drug is popularly supposed to give a quiet night's rest, without any of the after effects (headache, etc.) produced by various preparations of morphia. Now, chloral is what is termed cumulative in its action, which implies that even the same dose persisted in for a certain length of time may cause death. Of all hypnotics, chloral is by far the most deadly, and should never, under any circumstances, be taken except under medical supervision.

To epitomize what has already been said regarding sleeplessness: its rational cure should be arrived at in each individual case by seeking out *the cause*, and then removing the morbid action, of which it is but a natural sequence.

Lastly, sleeplessness under no circumstances should be neglected, as it acts disastrously both on the mental and physical forces.

Another contributor in *Chambers's Journal* relates the following, which is appropriate to the subject of this article:

When the health is in a satisfactory state, and there is freedom from care and annoyance, sound and refreshing sleep may be expected. Under such favorable circumstances, I usually sleep well, but have always found it difficult, when retiring to rest, to close my bedroom door on the cares and troubles of the day, and seek my pillow with thoughts of sleep alone. Whatever may have worried or caused recent annoyance is sure to intrude itself and be present in my thoughts when I endeavor to go to sleep; the brain is therefore kept active when it should be at rest, and consequently sleep is for a long time impossible. Toward morning, when the mind as well as the body has become wearied, some sleep may be obtained; but as the brain is not even then composed, it is generally unsound and unrefreshing.

Among the remedies that have been recommended for sleeplessness are—the repeating of poetry, counting up to a hundred several times, etc. I have never heard, however, that such remedies were at all useful, and the reason is, I think, obvious: they keep the brain engaged when it should be at rest. For a long time, therefore, I was anxious to discover some plan by which the tendency to mental activity would be lessened and a favorable condition for sleep secured.

I had frequently noticed that when engaged in deep thought, particularly at night, there seemed to be something like a compression of the eyelids, the upper one especially, and the eyes themselves were apparently turned upward, as if looking in that direction. This invariably occurred; and the moment that, by an effort, I arrested the course of thought, and freed the mind from the subject with which it was engaged, the eyes resumed their normal position, and the compression of the lids ceased. Now, it occurred to me one night that I would not allow the eyes to turn upward, but keep them determinedly in the opposite position, as if looking down; and having done so for a short time, I found that the mind did not revert to the thoughts with which it had been occupied, and I soon fell asleep. I tried the plan again with the same result; and after an experience of two years, I can truly say that, unless when something specially annoying and worrying occurred, I have always been able to go to sleep very shortly after retiring to rest. There may occasionally be some difficulty in keeping the eyes in the position I have described; but a determined effort to do so is all that is required, and I am certain that if kept in the down looking position, it will be found that composure and sleep will be the result.

It may be said that as the continued effort to keep the eyeballs in a certain position so diverts the attention as to free the mind from the disagreeable subject with which it had been engaged, sleep will follow as a natural consequence. It is not improbable that this is to some extent correct; and if so, it is well that by means so simple and so easily adopted, such a desirable result can be secured. But I think this is not the only nor the principal reason. The position in which the eyes should be kept is the natural one; they are *at ease* in it; and when there is no compression of the lids or knitting of the brows, the muscles connected with and surrounding the eyes are relaxed. This condition is certainly much more favorable for sleep than for mental activity or deep thought.

Phosphorus Manganese-Tin-Copper Alloy.

Messrs. Cockshott & Jowett, of Thornton Road, Bradford, England, have, after a long series of experiments, succeeded in alloying manganese with phosphorus and tin and copper, producing a metal which, for tensile strength and durability, they think will be found superior to any alloy in the market. This phosphor-manganese tin may be used exactly in the same manner, and in similar proportions, as phosphor tin—though it is better to cast at a little higher temperature—but the result will be found much superior both as regards hardness and tensile strength. Phosphor-manganese tin will be found a very convenient form in which to have the combination of manganese and phosphorus, as it will enable the brass founder to produce the bronze of a quality exactly suitable to the purpose for which it is required by adding a greater or less proportion of copper, etc., according as the bronze is required to be tougher or harder. This phosphor-manganese bronze is made in two qualities, No. 1 and No. 2, both the same price. The former is very tough and suitable for purposes where the castings are required to withstand a great strain. Mr. Kirkaldy, of London, has found this alloy to withstand the enormous strain of 34,754 pounds per square inch. The latter is for bearings and wearing parts of machinery, and is exceedingly hard, but at the same time very tough, the tensile strength being, according to Mr. Kirkaldy, 29,979 pounds per square inch.

Injurious Properties of Vanilla Beans.

A distinguished professor of the Faculty of Medicine of Bordeaux, Dr. Layet, has, says the *Lancet*, just read an interesting communication on certain injurious properties of vanilla, of which a satisfactory explanation has up to the present been wanting. The affections have been studied at a warehouse in Bordeaux, where on an average 25,000 to 30,000 kilogrammes of vanilla arrive every year. In these storehouses the pods are cleaned, sorted, and classed according to their quality. These manipulations seem to cause certain symptoms among the workmen and women. At first an itching of the face and hands associated with a powerful smarting sensation is experienced, and the skin becomes covered by a pruriginous eruption, swells, reddens, and desquamates at the end of some days. At other times there is a feeling of malaise with dullness, stiffness, and muscular pains, which oblige the worker to give up this kind of labor. The cutaneous malady seems to be due to an acarus which appears as a small, white, rounded body occupying generally the ends of the pod. This insect does not penetrate the skin like the *Acarus scabiei*, but determines the affection by its mere contact. Probably the parasite is aided in its irritant effects by the presence of "givre" in the form of pale acicular crystals. The nervous symptoms M. Layet is inclined to put down to the manipulation of inferior pods of vanilla containing much oily juice enveloping the seeds in the interior of the siliquæ.

Slate Making in Pennsylvania.

The Chapmansville quarries, in Northampton County, were opened in 1850, the first one being worked on a small scale in 1864. Here are located, states the Easton correspondent of the New York *Sun*, the Chapman and New York Slate Manufacturing Company, the Fischer Slate Company, and the Edelman Quarry. The quarry of the Chapman Company is a hole over 1,000 feet long, 300 feet wide, and 225 feet deep. It is called a flat rock quarry—the split of the slate inclining to the south at an angle of about ten degrees. The removal of the top is an item of considerable expense, varying with the location. When the top has been taken away a natural joint in the slate is sought, and if not readily found a hole is drilled and a blast made. The slate rock is split into blocks which are hoisted by means of derricks to the surface, when they are landed on trucks and moved along a track to the shanties where they are split.

"The splitter, with his mallet and broad steel chisels, sits on a block, and, taking, a slab of slate between his legs, drives in his chisel a little way at one end. He moves it a little with a firm, gentle pressure, and you can see the split begin to start as straight as a die. He repeats the operation at the other end. Then he drives his chisel in the middle and easily pries the slab in halves. The split pieces are split and split again until they are of the required thickness. As fast as they are split a man who stands by the splitter takes the slates and runs them through the dressing machine. This is a cast iron form set on five legs, with a steel extension piece or arm about four feet long. Suspended over this is a steel knife which is attached to a spiral steel spring and worked by the foot of the dresser. A gauge board guides his eye and he puts his slate against it, presses his foot on the treadle, and down comes the knife, cutting the edge clean and straight. He makes the four edges straight, and lays the slate in piles according to size. Just as fast as his foot can work, a good dresser keeps his machine going. The splitter and dresser work together, and are paid according to the quantity they turn out."

Diamond saws having a reciprocating motion and making 140 strokes per minute are also used. They cut only one way, being lifted by a cam for the return stroke. A constant stream of water clears the teeth of slate dust. The planers are similar to those used for planing iron, the polishing bed being of cast iron, 14 feet in diameter, and making 30 revolutions per minute.

A curious feature about the place is that the factory, engine house, smokestack, and many of the houses are built of slate blocks. There is a great demand for all kinds of labor in the whole region. Ordinary day laborers earn from $1 to $1.35 per day, and often more, according to the exigencies of the occasion. Carpenters earn $2.25 to $3.25. Bricklayers find work, but most new buildings are frame. Machinists are sought after daily, and make good terms, because practical men to work at the opening of new quarries and the erection of machinery are scarce. Slaters (splitters and dressers) earn from $2.50 to $4 and $4.50 per day by the piece. Quarrymen can always find employment.

The Westinghouse Brake.

Among other interesting cases recently recorded of the good services rendered by the Westinghouse brake, two in particular may be mentioned. On the 11th inst. an express train from Hull to Leeds, on the Northeastern Railway, when running over fifty miles an hour was turned off the main line into a branch at Crossgates, near Leeds, by a blundering signalman. The brake was at once applied, and the train was coming to a stand, when in taking another pair of points it was thrown off the line, and separated into two or three portions; but, thanks to the automatic nature of the brake, each was separately stopped and no one was injured. The other case was in the United States, and happened on the Baltimore and Ohio Railway. The Chicago *Tribune* says: "Yesterday morning at the dawn of day, when the express which is due in Chicago at 5:40 A.M. was about thirty odd miles from the city, and running at great speed, the engineer noticed smoke in front of him, and feeling a presentiment of danger, instantly applied the air brakes and stopped the train, loaded with its sleeping freight, just in time to keep it from plunging into the Little Calumet River. The bridge was burnt, and not over 30 ft. separated the locomotive of the train from the yawning abyss." The simplicity claimed for certain brakes would prove but a poor substitute for the quickness and certainty of the automatic brake in such cases as the above.

Work of the United States Mints.

The annual report of the Director of the Mint shows that the total amount of gold and silver received and worked during the year was $87,758,154, of which $49,145,559 was gold and $38,612,595 was silver. The coinage consisted of 98,666,624 pieces, worth $66,200,705. Of this amount $28,111,119 was in standard silver dollars. The total amount of fractional silver in the country is $235,000,000. The earnings of the mints during the year were $5,215,509, and the expenses $1,726,285. The total value of the gold and silver wasted at the four coinage mints was $30,084. while there was a gain from surplus bullion recovered amounting to $62,658. The director estimates the total coin circulation of the United States, on July 1, 1883, at $765,000,000, of which $537,000,000 was gold and $228,000,000 silver. The estimate on October 1, 1883, was $544,512,699 of gold, and $235,291,628 silver.

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ENGINEERING INVENTIONS.

An improvement in feed water heaters has been patented by Mr. John O'D. Keleher, of Gold Dirt, Col. It consists of two series or groups of water conducting tubes arranged after a specified manner within the fire box.

An improvement in means for oiling cylinders of steam engines has been patented by Mr. John G Donnenwerth, of Browning, Mo. It is intended to obviate the waste of oil ordinarily carried off by the steam, and while being economical secures the perfect lubrication of the cylinders.

An improved stop motion for railway heads has been patented by Mr. Clark A. Tabor, of Rockville, R. I. It is intended first to stop the machine when the roving breaks; second, when the trumpet is choked by bunches on the roving; and third, in case the roving winds around either of the calender or compact rollers.

An improved car coupling has been patented by Mr. Aaron Park, of Ottumwa, Iowa. The invention provides for a drawhead with two link apertures, one above the other, and with a U-shaped coupling pin having two downwardly projecting pins. The link raising frame is held to slide vertically in the drawhead.

An improved drawbar for cars has been patented by Mr. Halbert Rust, of Jeffersonville, Ind. It is so designed that the whole strain of the locomotive will come upon the drawbar, relieving the frame or body of the car of all pulling strain, as now experienced when the drawheads are attached to the timbers of the car in the usual way.

A railway tricycle has been patented by Mr. Henry K. Shauck, of Dayton, O. From a pair of flanged wheels, connected and suitable for use on a railroad track, is suspended a light frame projecting forward and backward, and to the forward end of a platform supported by this frame is secured a bearing for an axle of a small front wheel to run on one track.

Mr. William Fallon, of Newburg, N. Y., has patented an improvement in dumping cars. One of the objects of this invention is to convert temporarily an ordinary railroad truck into a dumping car, and the plan is such that, if desired, one-half the load may be dumped on one side of the car, and the other on the opposite side, at some other place.

A railway track cleaner for removing snow, ice, or earth packed against the inner sides of the rails, in a more simple and effective way than heretofore, has been patented by Mr. George Royal, of Davenport, Ia. It provides for a plan of hanging knives or cleaners in a special manner from the frame of the locomotive, in connection with brushes, so as to secure great strength without interference from bad joints in the rails, loose fish plates, etc.

Mr. James T. Godwin, of Norfolk, Va., has patented an improvement in dumping cars, of that class in which one or more holes are made in the car bottom for the discharge of contents, and provided with some kind of gate for closing. The object of this invention is to provide means for closing the gates so close as to hold grain, fine coal dust, etc., and yet strong enough to support coal or ore, while being easily operated from the usual position of the brakeman at the end of the car.

MECHANICAL INVENTIONS.

Mr. Thomas W. Cofer, of Portsmouth, Va., has recently patented a fly fan in which an oscillating or a rotating arm is provided with a brush or similar device which is to be rotated through the air. The blades are flexible, and are set in one and the same plane, and they are deflected according to the movement of the arm of the fan.

A new armature for dynamo electric machines has been patented by Mr. J. Edwin Giles, of Hazleton, Pa. The armature core is built up of a series of iron rings, axially in line, with oblique ribs on one or both of their lateral faces, the ribs separated by insulating material, and the object being to secure air circulation in the armature to carry off heat.

A machine for grading and cleaning coffee forms the subject of a patent which has been issued to Mr. Leon A. Gobin, of New York city. A blast of air is made to strike a sheet of falling coffee so that stones and heavy impurities will fall into one pipe, the large berries be carried into another pipe, the small ones into a third, and the broken berries, husks, and shells into a fourth.

Mr. Thomas Carney, of Arbuckle, W. Va., is the patentee of an improvement in lifting jacks, for use in the construction or repair of railroad tracks, and known as "track raisers." The number of parts in the construction of the implement is small, and the arrangement of leverage such as to enable a great force to be exerted on the rail, with a small degree of manual force from the operator.

Mr. Heman Ward Stone, Jr., of Morris, Minn., has patented a gear wheel which he claims to be noiseless. It is a well known fact that in iron rolling mills where large gear wheels are used the rattling of the gear teeth produces a noise which is almost unendurable inside the mills, and an actual damage to the value of property for residence in the immediate vicinity thereof. The patentee of the improved gearing interposes an elastic cushion between the plates forming the gear wheel, which prevents the vibration and noise usual in other large gear wheels.

AGRICULTURAL INVENTIONS.

Mr. James H. Orr, of Ukiah, Cal., has recently patented an improvement in animal shears which are adapted for very rapid work, and will not tire the hands as the common shears do, nor cut or injure the animal being sheared.

A cotton planter has been patented by Mr. William M. Lindsey, of Oakwood, Texas. It has agitating reels in the seed hopper to prevent the seed from clogging in the hopper, and the dropping of the seed is regulated by gates pivoted over the bottom plate and under easy control.

A gang and sulky plow has been patented by Mr. Thomas B. Nutting, of Morristown, N. J. It is so designed that the plow can be readily raised and lowered, and adjusted to work at any desired depth in the ground, and also so that the plow will be supported while at work, so that there will be no downward pressure upon the bottom of the furrow.

A sulky harrow is also the subject of a patented improvement by Mr. Thomas B. Nutting, of Morristown, N. J. It is designed to facilitate adjustment and promote convenience in control, so the harrow can be readily raised and lowered, and supported in such position as to work at any desired depth in the ground, and the side parts of the frame can be easily raised to pass obstructions.

Mr. William P. Brown, of Zanesville, O., has patented an improvement in wheel cultivators of that class in which the two wheels run upon opposite sides of the row of plants and sustain above the same a truck or frame work having a draught attachment for the team in front and plows behind, which are attached to and drawn by the truck. The improvement consists principally in the construction, arrangement, and adjustment of the plow beams and their couplings, whereby the plows next to the row of plants may be set in a higher horizontal plane, to adapt them to the elevation of the row or ridge upon which the plants are growing.

MISCELLANEOUS INVENTIONS.

Mr. Robert Holbon, of Alpena, Mich., has patented an improvement in wipers for the commutators of dynamo electric machines. It is so located as to be revolved in connection with the armature shaft, and keep the surface of the commutator clean and bright, so that there will be a perfect contact with the brushes.

A fish net, or netting, made of metal instead of thread or twine, has been patented by Mr. William H. Boyd, of Louisiana, Mo. Copper or other wire is used, of moderate flexibility, bent in zigzag manner to make loops, each loop having one rounded closed end, and being twisted at its opposite end round the closed end of a loop in a succeeding row.

Mr. John J. Dillard, of Eureka Springs, Ark., has patented an improved medicated soap, specially intended for use in skin diseases, besides being an agreeable toilet article. It is compounded of Eureka Springs (Ark.) water, or its chemical equivalent, sulphur, glycerine, borax, chrysophanic acid, tincture arnica, cocoanut oil, and concentrated lye.

Mr. J. A. Campbell, of Waco, Texas, has patented an improved oil can, in which the nozzle remains closed, except when the bottom of the can is pressed, thereby preventing useless waste of oil. This also prevents the oil outlet from being stopped up, and enables the operator to see how much oil is given to each hole, and to facilitate the removal of dirt and grease from the oil holes before oiling.

A simple and effective dust ring for watches has recently been patented by Mr. S. M. Morgan, of Kingsland, England. The ring, which is of peculiar form, is fitted in the case before the movement and secured by screws, after which the movement is fitted to the ring. The ring does not afterward require to be removed, the movement alone being taken out for cleaning, leaving the ring permanently fixed in the case.

An evaporator for making sugar from juices has been patented by Mr. Orlando B. Jennings, of Honey Creek, Wis. It consists of an upright externally evaporating cylinder, with a series of outer distributing cups, so that evaporation will take place as the liquid runs in thin film over the outside of the cylinder, these cups being arranged so as to be readily attached or removed. The evaporation may be open or by boiling *in vacuo*.

An improved bag fastener has been patented by Mr. Charles W. Bradford, of Belfast, Me. It consists of a circularly curved spring pivoted at one end between cross pieces, and at the other end having a suitably arranged locking lever; a hook and chain attached to the cross pieces then facilitates the easy fastening and firm holding of the bag. This fastener can be readily adjusted for bags of three sizes or thicknesses.

Mr. William Cleather Gordon, of the Langham Hotel, London, England, has patented in this country an improved electric fire alarm apparatus, principally for hotels and other large structures. There are one or more indicators on each floor, each having as many signaling apertures and corresponding signal disks, so that an alarm of fire originated on any floor or locality on any floor may be sounded simultaneously wherever desired, and convey precise information of its whereabouts.

An apparatus for raising sunken vessels has been patented by Mr. Henry Schuyler, of Sturgeon Bay, Wis. It provides that, from a float at some distance from the sunken vessel, two chains be carried by tugs completely around and at some space therefrom: that these chains be then connected by a third short one with rings on each end, through which the other chains are passed, after which the loop so formed around the sunken vessel may be drawn in close under her keel, and the vessel lifted in the usual way by hoisting machinery on scows.

Mr. A. K. Schaap, of Richmond, Va., has recently secured a patent for an improved mask for protecting the faces of baseball catchers. The ordinary mask gives the protection required, but in case of what is technically known as a "tip foul" ball, which requires the catcher to look upward, the net work of wires obstructs the vision and interferes with the catching of the ball. This invention overcomes these objections by forming the cushioned frame and the net work of wires in two distinct parts, which are hinged together at one side and provided with a spring catch for holding the net work in closed position, and a spring for forcing the same open when the catch is released. By simply pressing a button attached to the catch, the net work will open to one side automatically without necessitating any change of the position of the head or direction of the eye.

Insurance.

The Connecticut Fire Insurance Company, of Hartford, has total assets of $1,781,626, of which the policyholders' surplus is $1,292,316, being its cash capital of $1,000,000, and its net surplus of $292,316. The company is officered by experienced and careful men, and is amply able, as above shown, to respond to all its contracts. A good thing for burns is a policy in this institution when the fire comes.

The New England Mutual Life Insurance Company, of Boston, is the oldest and largest life insurance company holding a Massachusetts charter, and is in most prosperous condition, as its statement of assests and liabilities proves. The New England Mutual is not a monopolist, and avoids all extravagance in seeking business, and its publications are kept strictly free from depreciatory comments on its competition of every sort; but the company has ample accommodations for doing an increased business with a resulting advantage in economy to all its members, and, as under the new "Life Rate" endowment feature it offers a positive guarantee of such economy in the lowness of the premiums, considering the extra advantage which the policies secure, it certainly deserves the large increase of its patronage incident to the adoption of the feature which it anticipates and is already receiving.

Statistics show that of accepted lives by the insurance companies one out of every five reaches the age of 75.

The Mutual Life Insurance Company, of New York, are erecting the finest insurance building in the country, and hope to take possession on the first of next May.

The United States Mutual Accident Association, of New York, has over $70,000,000 accident insurance in force, with weekly indemnity of over $18,000,000 per annum.

The life insurance companies of the United States carry insurance upon over one million lives, amounting to upward of one and a half billion dollars.

A Paris company has been formed to insure against losses resulting from delays in the delivery of merchandise.

Financial.

Brown Brothers & Co., 59 Wall Street, New York, issue commercial and travelers' credits available in all parts of the world.

Preston, Kean & Co., of Chicago, Ill., make a specialty of investment securities.

The exchanges at the New York Clearing House for the year ending June 30, 1883, amounted to $40,293,155,259.65, and the balances to $1,568,983,196.05.

The total amount of resources of all the national banks, according to the reports made the Comptroller of the Currency October 2, 1883, were $2,372,656,364, against $2,399,833,676 in 1882, and $2,358,387,391 in 1881. The number of national banks in operation was 2,501 in 1883, 2,269 in 1882, and 2,132 in 1881.

The total amount of currency of all kinds in existence in this country on October 1, 1883, was, according to official reports, $1,730,597,823.

Chief Justice Beasley, at Trenton, N. J., recently decided that buying stocks on margin was virtually gambling and therefore illegal; but if the stocks were bought, a deposit made, and title passed, then, without giving possession of them, it was legal.

Manufacturing Notes.

Across the street from the office of the SCIENTIFIC AMERICAN is the extensive clothing warehouse of Devlin & Co. They have recently enlarged and improved the front of their building. The panes of glass used in the new windows exceed in size those of any other building in the city.

It is proposed to form a stock company with a capital of $50,000 for the manufacture of woolen goods in Union, N. H.

The Bramble Lock Works, Terre Haute, Ind., are being rapidly got into shape. The machinery will soon be placed in position.

The works of the Knickerbocker Manufacturing Company, who will manufacture milling machinery, are rapidly going up at Jackson, Mich.

The Saucon Blast Furnaces, now idle at Hellerstown, Pa., will probably be sold to a company that will build a rolling mill to run in connection with the furnaces.

The Eagle Iron Works, of Terre Haute, Ind., have the machinery completed and ready to be placed in position. It is understood the mill will be ready for operation by November 26.

The Duryea Starch Factory, at present located on Long Island, N. Y., is to be removed to some point in the West, and the people of Quincy, Ill., are making an effort to secure its location. Several hundred men are employed.

Mr. Otto, inventor of the Otto gas engine, has recently obtained perpetual injunctions against three English firms, restraining them from infringing his patent, and in a fourth case has obtained judgment for an injunction.

The special illustrated catalogue of heavy woodworking machinery, just issued by J. A. Fay & Co., Cincinnati, O., gives the most information of any of its kind that has come to our notice. The engravings are clearly defined illustrations of the machines, and the letterpress plainly descriptive. Several new machines are represented.

Hewes & Phillips' Iron Works are getting out a new pattern Corliss engine, which they will build in sizes from 35 to 1,000 horse power.

Business and Personal.

The Charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

For Sale.—U. S. Patent No. 277,399. Address Geo. Worthington, South and German Streets, Baltimore, Md.

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If an invention has not been patented in the United States for more than one year, it may still be patented in Canada. Cost for Canadian patent, $40. Various other foreign patents may also be obtained. For instructions address Munn & Co., SCIENTIFIC AMERICAN Patent Agency, 261 Broadway, New York.

Guild & Garrison's Steam Pump Works, Brooklyn, N. Y. Steam Pumping Machinery of every description. Send for catalogue.

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Nickel Plating.—Sole manufacturers cast nickel anodes, pure nickel salts, polishing compositions, etc. Complete outfit for plating, etc. Hanson & Van Winkle, Newark, N. J., and 92 and 94 Liberty St., New York.

Lists 29, 30 & 31, describing 4,000 new and 2d-hand Machines, ready for distribution. State just what machines wanted. Forsaith & Co., Manchester, N. H., & N. Y. city.

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Water purified for all purposes, from household supplies to those of largest cities, by the improved filters manufactured by the Newark Filtering Co., 177 Commerce St., Newark, N. J.

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Fossil Meal Composition, the leading non-conducting covering for boilers, pipes, etc. See adv., p. 333.

Curtis' Expansion Trap See illustration on p. 118.

C. B. Rogers & Co., Norwich, Conn., Wood Working Machinery of every kind. See adv., page 285.

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Steam Pumps. See adv. Smith, Vaile & Co., p. 301.

Philosophical and Chemical Apparatus and Materials. Send for catalogue. Queen & Co., Philadelphia.

American Fruit Drier. Free Pamphlet. See ad., p. 318.

Brass & Copper in sheets, wire & blanks. See ad. p. 317.

The Chester Steel Castings Co., office 407 Library St., Philadelphia, Pa., can prove by 20,000 Crank Shafts and 15,000 Gear Wheels, now in use, the superiority of their Castings over all others. Circular and price list free.

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Tight and Slack Barrel Machinery a specialty. John Greenwood & Co., Rochester, N. Y. See illus. adv. p. 318.

Walrus Leather, Nickel Anodes, Salts, and all Platers' Supplies, Greene, Tweed & Co., New York.

Our goods rank first for quality, safety, and durability. Please compare them with any other make, and is not found better and cheaper, quality considered, we will bear the expenses of the trial. Lehigh Valley Emery Wheel Co., Lehighton, Pa.

Special Students in Technical Chemistry, Analysis, and Assaying. Apply to Prof. Leeds, laboratory of the Stevens Institute of Technology, Hoboken, N. J.

Pays well on small investment.—Stereopticons, Magic Lanterns, and Views illustrating every subject for public exhibitions. Lanterns for colleges, Sunday-schools, and home amusement. 116 page illustrated catalogue free. McAllister, Manufacturing Optician, 49 Nassau St., N. Y.

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Straight Line Engine Co., Syracuse, N. Y. Best in design, materials, workmanship, governing; no packing.

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Notes & Queries

HINTS TO CORRESPONDENTS.

No attention will be paid to communications unless accompanied with the full name and address of the writer.

Names and addresses of correspondents will not be given to inquirers.

We renew our request that correspondents, in referring to former answers or articles, will be kind enough to name the date of the paper and the page, or the number of the question.

Correspondents whose inquiries do not appear after a reasonable time should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them.

Persons desiring special information which is purely of a personal character, and not of general interest, should remit from $1 to $5, according to the subject, as we cannot be expected to spend time and labor to obtain such information without remuneration.

Any numbers of the SCIENTIFIC AMERICAN SUPPLEMENT referred to in these columns may be had at the office. Price 10 cents each.

Correspondents sending samples of minerals, etc., for examination, should be careful to distinctly mark or label their specimens so as to avoid error in their indentification.

(1) H. B. S. asks: What power will be required to force a steel shaft 2 inches diameter into a block of cast iron 4 inches square, bored the proper size to make a very tight fit? These blocks of iron are 24 inches long, and the shaft goes through, having a bearing at each end of about 6 inches. If the shaft is turned 2 inches diameter, what should the bore be, or, in other words, what should be the difference between the shaft and the bore? A. If we understand you right as to what you wish to accomplish, we think you will find it impracticable to force a steel shaft through a hole 24 inches long having perfectly parallel sides. The shaft will drag and give you a great deal of trouble. A taper of two one-hundredths to three one-hundredths of an inch in the length to be driven, and ream the block three-fourths through with a reamer that cuts the size of the shaft at the center, and the rest of the way with a reamer that cuts the size of the point of the shaft; clean and oil before driving. You will have to use much judgment, and it generally requires experience to do this properly to prevent dragging of the metal or splitting the block. For short distances of three or four times the diameter, driving can be done with an enlargement of shaft of fifteen one-thousandths of an inch.

(2) C. S. asks: What is the cause of the occasional singing of the bass violin string? What is the remedy, if any? A. There is no remedy for the vibration of the bass string. It is caused by shrinkage of the catgut. This is avoided in the best strings by more painstaking in making.

(3) C. F. W. asks: Is the screw or propeller for ocean steamships considered to work perfectly in every particular? A. There are disadvantages, such as friction of the blades in the water and that a very large proportion of the power applied is lost by indirect action.

(4) T. M. G. asks: 1. What is the greatest speed an engine could be run, driving wheels 10 feet diameter, and not leave the track? A. This cannot be answered in general terms, as much depends upon the track and height of center of gravity of engine. On good track 80 to 90 miles per hour has been made for short distances. 2. What can be put in water to make it so that it will not freeze? A. Alcohol, if added in sufficient quantity, will answer every purpose.

(5) L. K. asks how to make the electric call bell for a telephone; or if you have an issue of your paper which gives the full demonstration of it, I would like to know. A. See Telephone Calls in SUPPLEMENT No. 162. 2. I am making a horse shoe telephone, and what kind of paint can be used to give the mouthpiece a black, glossy appearance? A. Add a little fine lampblack to shellac varnish, and apply it with a camel's hair brush to your telephone mouthpiece.

(6) W. S. R. asks: What substance is used in gluing sawdust and other fibrous materials together? Also if it is used in a dry state, and if not, what will act as a glue and render it both tenacious and firm when it is submitted to a hard pressure? A. We know of nothing better than common glue. Shellac is sometimes used. For kindlers powdered resin is mixed with the sawdust. The whole is then heated and compressed. The shellac and resin are used dry, but with heat. The glue would of course be wet.

(7) J. A. asks: Is there a fluid that a mark made on paper with it will conduct electricity, and what is the composition of it? Does it color the paper? Are there any uses to which it has been put? If so what are they? A. The following solutions are used in the electro-chemical telegraphs:

a. Nitrate of ammonia ..... 4 pounds.
Ferricyan. potassium ..... 1 ounce.
Gum tragacanth ..... 4 "
Glycerine ..... 4 "
Water ..... 1 gallon.

b. Nitrate of ammonia ..... 2 pounds.
Muriate " ..... 2 pounds.
Ferricyan. potassium ..... 1 ounce.
Water ..... 1 gallon.

The current passing through paper saturated with either of these solutions turns the paper blue.

(8) C. H. B. asks: 1. How many gallons of water can be pumped from a well per hour by steam power, through a 4 inch pipe? A. It will depend somewhat on the length of pipe, but cannot exceed about 87,000 gallons per hour. 2. How much water will pass through a 1½ inch pipe per hour, with an average pressure of 40 pounds? A. It is affected by the length of pipe, but cannot exceed about 24,000 gallons per hour.

(9) J. E. E. asks (1) for some practical directions about putting together a steam yacht. He wishes to learn how the frame is made, so that planking will go down flat on ribs and not hit only on a corner of the rib; also general construction of hull, not only dimensions of hull, but dimensions of timber in proportion to one another. A. Lay down your boat's lines full size on a mould loft floor, and from this you can get the bevel of the ribs or frames at any point, and if they are sawed square, they must be beveled by hand. Our SUPPLEMENTS give more details respecting the construction than any published work we know of. The "Practical Boat Building for Amateurs," gives many details that are applicable to all classes of boats. The fastening of planking to frames may be by nails, screws or rivets; the common mode is by copper nails driven through and riveted on a ring, and in the better class of boat copper rivets driven through and riveted parts of frames may be fastened by iron rivets driven through and riveted on ring or washer. Ribs or frames, if steamed and bent, are made in one piece. If sawed or cut from crooked timber or roots, they may be in two or three pieces. As to dimensions of frame, you can judge of proper size from dimensions given for different sizes of boats in our SUPPLEMENTS. 2. Equivalent of metric system in our system of weights and measures. A. You will find the French measures with their equivalents in English measure in Trautwine's "Engineer's Pocket Book." This book will also be of great value to you for other information.

(10) A. C. Y. asks: What amount of power is lost in a side wheel steamer caused by the lifting of water? A. It depends in great degree upon the diameter of the wheel and amount of dip. 2. Also of a screw propeller. A. With a screw propeller, upon its diameter and pitch. There is no rule of general application. 3. With the same power applied, without the present resistance to overcome, what would be the gain in speed to a vessel which now runs 18 knots an hour? A. Without defining more specifically, this question cannot be answered.

(11) M. M. L. asks: If a radiator be placed below the base of a boiler, in heating by hot water, will there be circulation sufficient to heat an ordinary sized room? A. You can heat a room with a circulating coil below the boiler, but you must have an upward or ascending column at or above the boiler to induce a flow, or you can make the coil the end of circulation from the other rooms. It will not be as hot as a proper circulation, and would require more pipe, say for your room of 1,200 cubic feet, 50 feet of 1 inch pipe.

(12) H. V. C. writes: Last winter I dug a well 12 feet deep and put in a galvanized iron pump. Now if I pump water, it has a very disagreeable smell and taste, while water drawn with a bucket does not have any smell, being very good for drinking. A. The bad taste given to the water is undoubtedly caused by the influence of the zinc upon the water which has been standing in the pipe. You should always waste as much water as the pipe and pump holds before catching the water for drinking or cooking; for other purposes it is harmless.

(13) W. H. L. asks if water drawn from galvanized iron ice coolers is also injurious. A. Yes; if the water has been left standing in the cooler for any length of time. Such an ice cooler should be completely emptied at least once a day before refilling.

(14) T. H. R. asks: What is the best method of getting rid of the quality of stickiness in boiled linseed oil, or of overcoming such stickiness in canvas or calico cloth already dressed with that oil? A. The stickiness complained of probably arises from the want of proper driers. The linseed oil should be boiled with at least 12 ounces of litharge or oxide of lead to one gallon. For cloth that is already dressed with oil, painting with turpentine that has been treated with litharge and exposure to the sun for a day may accomplish what you desire, but will not look as clean and bright as the oiled goods were originally. Another way is to rub powdered soapstone upon the surface of the goods and then expose them to the sun. This will also change the color, but is preferable to sticky surfaces.

(15) J. H. M. in SCIENTIFIC AMERICAN of November 10 (No. 25) asked about siphon, and in the reply the editor should have suggested that he could raise water by that means only about 28 feet.

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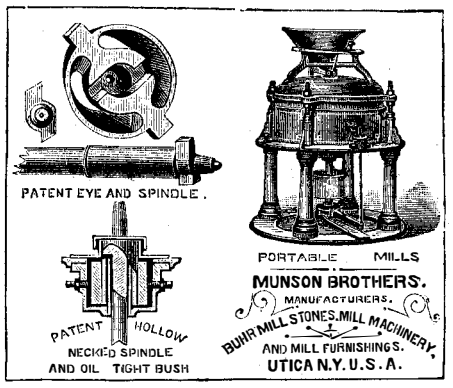

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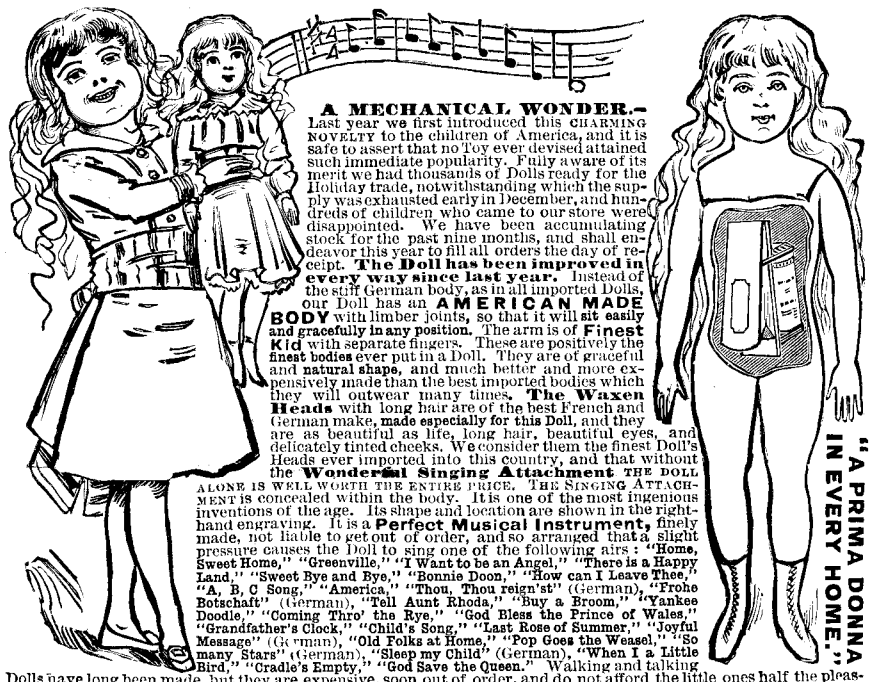
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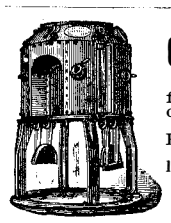

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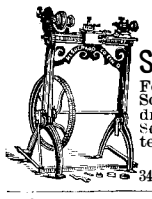

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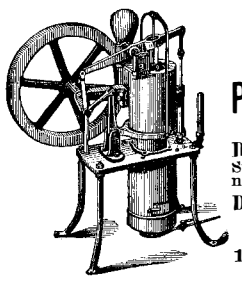

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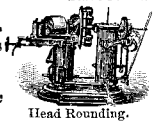

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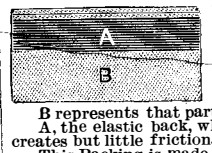

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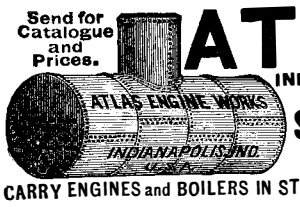

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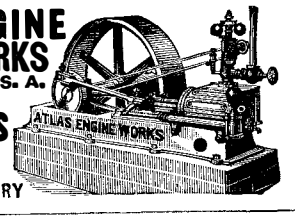

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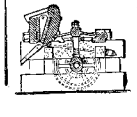

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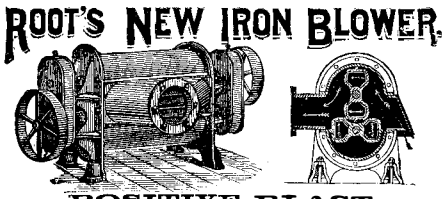

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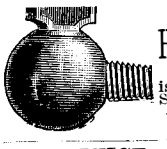

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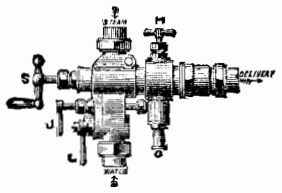

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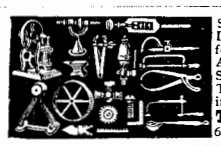

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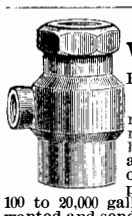

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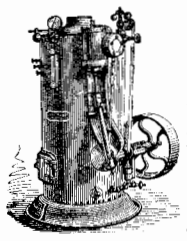

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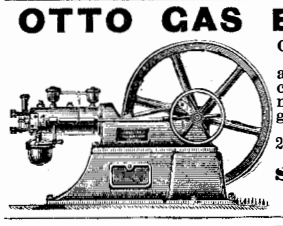

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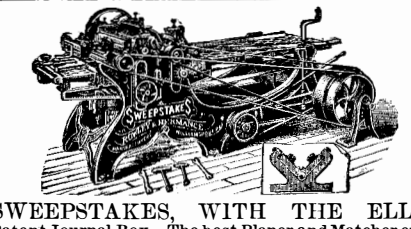

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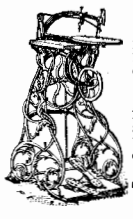

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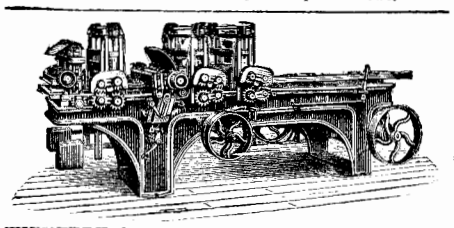

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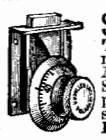

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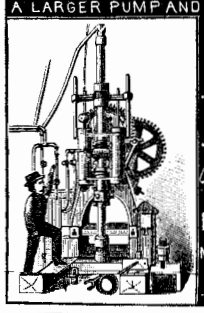

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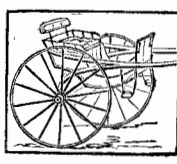

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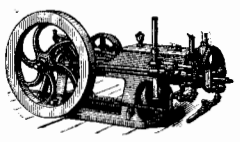

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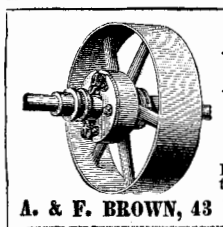

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